FOOD MANUFACTURE

Incorporating Food Industries

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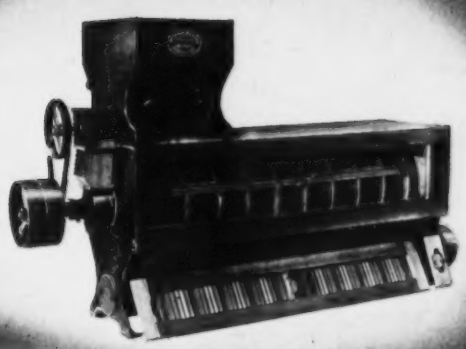
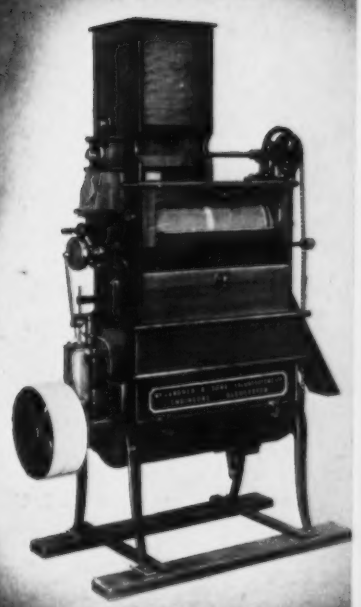
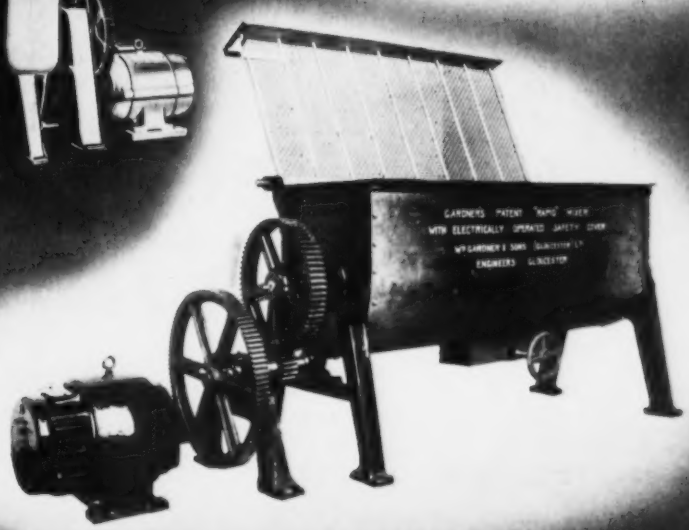
DECEMBER 1, 1939

THIRTY YEARS HENCE...







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A JOURNAL DEVOTED TO THE PRODUCTION AND MANUFACTURE OF ALL EDIBLE COMMODITIES INVOLVING A PROCESS OF MANUFACTURE.

FOOD MANUFACTURE

Incorporating Canning, Packing and Preserving.

VOLUME . . . XIV

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DECEMBER 1, 1939

Food Packaging Number

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The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

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Facing first page of Editorial

FOOD MANUFACTURE

Vol. XIV, No. 12 December 1, 1939

Emergency Packing

AT THE present juncture we are faced with two conflicting principles in regard to packing foodstuffs. The first is adequate protection against gas and the other the possible shortage and, therefore, the more economic employment of packing materials. In the admirable little booklet issued by the Home Office entitled *The Protection of Foodstuffs against Poison Gas*, to which we referred in our January, 1938, issue, some interesting points were raised.

The modern method of packaging is praised over the older method of doling out in bulk because it offers greater protection against poison gas. It is pointed out that every layer of material which may help to prevent gas coming into contact with foodstuffs is of value, but the second principle we have referred to now comes into operation. How long will sufficient supplies of wrapping material to allow for a single layer, let alone several, be available? Also, what protection against gas is provided by the available wrappings?

Airtight tins and glass bottles offer complete protection, and every economy should be exercised in the use of tinplate so as to leave adequate supplies for foodstuffs. Ordinary paper, sacks and textiles offer little or no protection against gas. Different types of tarred papers and tarpaulins offer varying resistances, as do certain rubber impregnated textiles. These should be looked into, but as far as we can see at present bottles and tins are the only packs to resist gases, and these should be used whenever possible.

Canned Salmon Bones

In view of the popularity and relative cheapness of canned salmon, the experiments of Basil E. Bailey on the nutritive value of canned salmon bones are of interest.

A rachitogenic (ricket-producing) diet was fed to two groups of young albino rats, now almost universally used in biological assays for vitamin D. In such assays the animals are started on this diet when they are from 28 to 32 days old. They are maintained on it for approximately three weeks to induce rickets and for a further ten days during which they are given graded doses of, for example, a fish oil whose vitamin D potency is to be determined. They are then killed and their bones examined by a standard technique to measure any recalcification which has taken place. In the experiments described, recalcification similar to that produced by vitamin D was brought about by the addition to the ration of a small percentage of the bone from canned pink salmon. The fact that rickets can be alleviated by mineral feeding alone is not a new discovery. It is well known in the poultry industry that the amount of vitamin D required by chickens can be reduced to a minimum by careful adjustment of the quantities of calcium and phosphorus in the ration. The experiments show that the bones of canned salmon, although often regarded as inedible, can serve as a valuable nutritional source of bone-forming minerals.

Evaporation Losses in Foods

The problem of loss in weight of prepacked articles, such as flour, peas and lentils, is a continual source of anxiety to packers of such commodities. Zealous, well-meaning, but not over imaginative inspectors prowl about like pocket battleships or U-boats in search of prey. In practically every case where short weight is found, faulty weighing is alleged and perfectly honest traders are forced to bear the stigma of fraud.

The inspectors who administer the Act do not seem to realise the possibility of loss by evaporation—in fact, in a case at Witham, Essex, last month an inspector, when asked if flour was subject to evaporation, said that in his experience flour

was likely to gain in weight. If that is so his experience must be limited to periods of storm and deluge only, and presumably he goes off duty in every heat wave!

Although the inspectors fail to realise—or deliberately ignore—the possibility of evaporation, those who framed the Act evidently realised it as they inserted a clause covering loss by "unavoidable evaporation or drainage". Of course, this is very vague and difficult to interpret. What is unavoidable and what can be regarded as the maximum variation in weight that can be ascribed to the vagaries of our English climate?

Exhaustive Research

Much investigation has been carried out on the variation in the weight of packages of various moisture-containing substances. Probably the most exhaustive research was that on flour by Fairbrother (*Cereal Chemistry*, vol. 6, 1929, p. 379), who showed that as much as 4 per cent. loss could be accounted for as a result of unavoidable evaporation.

It does not seem to be a simple matter to prevent loss by evaporation in certain circumstances any more than a gain in weight could be stopped in other conditions. The fact remains, however, that the Act stipulates that the evaporation must be "unavoidable". This means primarily that the material packed must not be overloaded with moisture. In the case of flour 14 per cent. moisture is quite high enough to be compatible with good milling, but in many cases this is much exceeded. Storage conditions, too, have an influence, and the packets should be stored out of draughts and away from heat. But apart from these primary and rather elementary precautions the question that looms out in front of us is whether evaporation could be avoided by altering the type of package.

Packaging Problems

Flour, such as self-raising flour, sold in small quantities to housewives is generally packed in paper bags which are gummed, or linen bags which are stitched or tied. Neither of these packs prevents evaporation, and Fairbrother showed that the evaporation was about the same in both cases.

It has been proved that if flour is packed in a hermetically sealed tin evaporation is completely prevented. Unfortunately there enters here the cost factor, and in this method of packing the package costs as much as the flour packed. Thus a 1-lb. package of flour which now costs 3d. might cost 6d., which puts it out of court. There are possibilities about wrapping the bags in a cellophane wrapper, but we understand the difficulty in this is effecting a suitable sealing. In the larger factories, packing flour in small dimensions, automatic packeting machines are employed, and the sealing of any wrapper would have to be done on the machine, which means a very rapid acting adhesive, and no heating device can be employed.

If a suitable wrapping material could be devised at a reasonable cost in comparison to the value of the commodity to be sold, and which could be adapted for use on automatic packing machines, it would prove a great boon to the packers of flour, peas and other substances which may lose weight by the evaporation of moisture. We fear, however, that the cost will be the snag. It is one thing to wrap a packet of cigarettes worth 1s. 2d. in a cellophane wrapper, but quite a different matter to wrap a bag of flour over ten times as big which is worth only 3d.

Sodium Nitrite Ice for Fish

During the past twenty years several attempts have been made in various countries to improve the keeping quality of dressed fish by icing them with ices containing germicidal compounds. In the Pacific Fisheries Experimental Station, Prince Rupert, B.C., different investigators have performed experiments with ices containing chlorine, sodium hypochlorite, hydrogen peroxide, ozone, carbon dioxide, benzoic acid and other substances. In June of this year H. L. A. Tarr and P. A. Sunderland pointed out that small amounts of either sodium or potassium nitrite (0·05 to 0·2 per cent.) added to brines in which fish fillets were dipped inhibited bacterial spoilage in the fresh or subsequently lightly smoked product to a larger extent than when benzoic acid or sodium benzoate was employed.

The authors now describe (Progress Report, No. 41) experiments in which nitrite was added to ice used in icing halibut, pink salmon and black cod (sablefish). Ice containing 0·5 per cent. sodium nitrite causes the fish muscle to absorb much more than 200 parts per million of nitrite, whereas ice containing from 0·05 to 0·1 per cent. sodium nitrite is effective without causing the treated fish to take up an excessive amount of the compound. Unfortunately in the case of halibut, ice containing nitrite causes a definite yellowish discoloration on the white side of the fish, but in the case of pink

salmon and black cod little if any change in external appearance was noticed.

The report is described as merely a brief survey of results so far obtained. Further experiments will be carried out, and it is intended to describe these more fully in due course.

The bactericidal effect of such small quantities of nitrite is interesting and worthy of further attention, especially now that its practical application is possible, due to the recent change of the Regulations governing the use of nitrite. All meat chemists will welcome (rather sardonically perhaps) the death of the nitrite fallacy.

Canned Foods in Relation to Health

Sir William Savage, who in 1923 delivered the Milroy lectures under the above title, returned to the subject in an article in the *Lancet* for November 4, in which he examines the present state of knowledge regarding the health aspects of canned foods.

Thanks to the large volume of experimental work performed and published during the past few years in this and other countries, the matters treated are, at least to those associated with the canning industry, already commonplace. However, the old prejudice against canned foods has not yet received its *coup de grâce*, and it is all to the good that the message be conveyed in a journal mainly catering for the medical profession by an expert such as Sir William.

The health aspect is examined from three angles. First, whether the nutritive value of foods is adversely affected by canning; second, whether the food is prejudicially affected by added chemical substances or substances which might be derived from the containers; and third, the liability of canned foods to convey or cause disease of bacterial origin, and, if so, what is the risk compared with the same food consumed in the " fresh " condition.

With regard to the first, Sir William points out that on the nutritive side fresh foods actually fall short of the canned variety when losses in preparation and domestic cooking are taken into account. We personally feel that this is an aspect of canned foods which is insufficiently stressed to the consumer. It was very cleverly done by a firm of French pea packers a year or so ago, as described in this journal.

Returning to Sir William's article, he stresses the matter of the preservation of the vitamins, which has been demonstrated on all sides. The view that canned foods are devitalised (whatever that means in connection with food, but one of those dangerous words which come trippingly to the tongue to impress the uninformed!) is not supported by nutritional research. The designation of the modern housewife as a mere tin-opener is a gibe directed at her and not at the food she extracts from the tin.

Chemical and Bacteriological Aspects

Sir William disposes of the bogey of tin and lead poisoning. No lead or tin poisoning now ever results from the consumption of canned foods. An action was recently brought against a well-known firm who had supplied sardines containing 26 parts per million of lead, and no evidence was forthcoming that such a quantity was harmful, and the verdict was in favour of the defendant. At the same time we find that the Public Health Imports Regulations have decided that imported sardines must not contain more than 5 parts per million of lead. However, the idiosyncrasies of food regulations is another story!

With regard to food poisoning, from the study of all the data available it can be confidently stated that canned foods are now considerably less liable than ordinary foods to be a source of food poisoning. This is conspicuously so for the more dangerous outbreaks associated with the presence of living bacilli. With regard to milder outbreaks of toxin type, the liability to cause them is less, bulk for bulk, with canned foods than other foods.

It cannot be too often reiterated that canned foods may be accepted as a safe and convenient source of food without any special hazards, nutritional, chemical or bacterial. Coming at a time when canned foods will be increasingly useful, Sir William Savage's article is opportune and should be reassuring to the medical profession, the members of which, in their turn, are in a position to reassure those members of the general public, and there are still quite a few, who look askance at the contents of a tin can.

Amateur Canning

There has been considerable activity in the matter of amateur canning, according to the papers.

Without wishing to throw cold water upon laudable attempts to conserve food which, in the case of surplus fruit and vegetables, might otherwise be wasted, we feel that unless this canning is carried out under expert supervision there may not only be considerable waste of material but some risk of

food poisoning, especially where vegetables are concerned.

We are well aware that there are good and exact instructions available for home canners, but the amateur may not realise the necessity for a very close adherence to each and every item of procedure.

We are also aware that in connection with the work of women's institutes and the like there are competent people who are capable of supervising the work. To them we say, "Go ahead". To others for whom advice is not directly available, we suggest that they adopt methods of preservation other than canning. After all, the produce of the individual, if judiciously spread out among a number of things, will not result in a glut, and therefore canning, except in the cases mentioned, may be left to the commercial undertakings.

Medical Services

Arising from the meeting of the British Medical Association at Aberdeen there has been considerable correspondence in the daily papers, and the opposition to doctors as civil servants has been considerable.

It is curious to note that there is a fixed idea in the minds of many of the correspondents that should they be employed they would not work so well or with such interest and that incentive (presumably to make more money by getting more patients) would be absent in the employed doctor. We wonder whether an employed engineer building a bridge would not put as much energy and care into his work for the better safety of people using it whether he be an employed man or freelance?

Another point that has been raised is the importance of the "personal touch" and that people insist on selecting their own doctor. We are rather wondering how they do it. A great proportion of the population of any large city may almost be called nomadic and change from suburb to suburb and flat to flat. Unless they know anybody in the particular neighbourhood into which they have gone, one way of finding a doctor is to walk around and look for a red light, or go to the various local chemists who will give quite excitingly varied accounts of the local medicos. It would seem that at least those members of the medical profession who became articulate in the correspondence columns of the papers are a little bit removed from reality. Apart from domestic servants, the ordinary man or woman does not choose, or even see, many of the people to whom he relies as greatly for his personal safety and comfort as he does on the doctor. On train or bus journeys, does he choose his engine or bus driver? In the restaurant the important work of food preparation is undertaken by an unknown *chef*, and so on.

We feel that the opinions expressed do not tend to present the medical profession in its proper light and the arguments put forward would tend to produce a sense of disquietude in the layman if they were not so extremely feeble.

Table Manners

Two distinguished Englishmen were dining some years ago at a restaurant in Buenos Aires. The occasion was the first dinner on shore after the voyage from England. After the meal one of them turned to his companion and murmured as he stretched his hand towards a silver receptacle containing them, "Thank goodness we're in a country where one can use toothpicks."

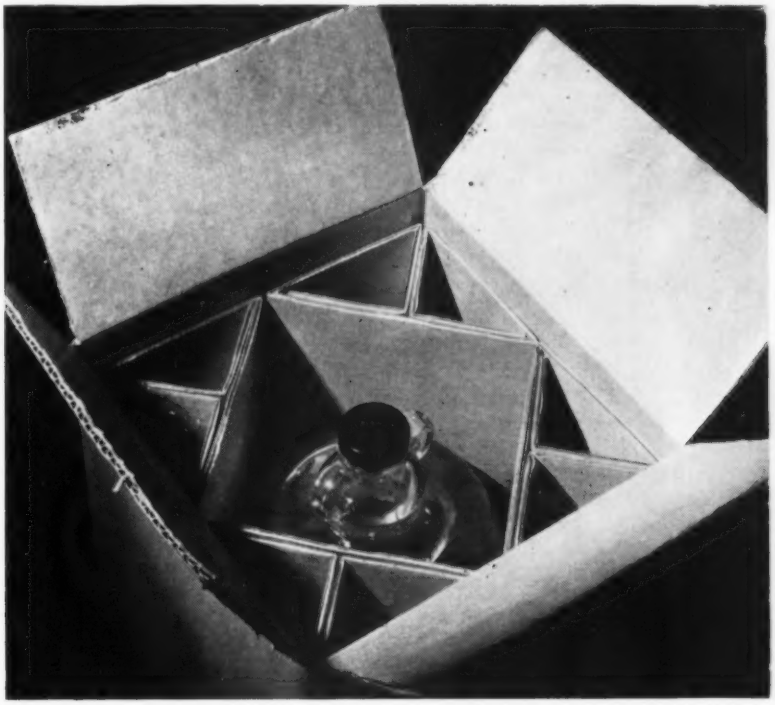
We are reminded of this by what Mr. Tom Smith, the President of the American Bakers' Convention, is reported to have said: "If only some authority on etiquette would authorise 'gravy sopping', the public, who like their gravy, would be delighted." Presumably so would Tom on behalf of the bakers.

Of course, gravy sopping is quite *de rigueur* among people whose designation is not "naice", but it would be interesting to watch the guests (say) at the Lord Mayor's Banquet, mopping up the last vestiges of their turtle soup in the way suggested.

If it is a matter of encouraging trade, there are several little things we might copy. The matter of the toothpicks already mentioned would encourage the wood or even revive the quill industry, although perhaps depress dentistry, because the inhabitants of tooth-picking countries seem to have remarkably fine teeth.

In many countries, one knife and fork must serve for all dishes up to the sweet. Knife and fork between courses are wiped with bread (which is subsequently consumed), and during the intervals between courses the fork is placed sideways on the table and the blade of the knife inserted between the prongs. The resulting economy in soap, soda, fuel and labour for washing-up must be considerable.

These are just a few examples which occur to us offhand, but, doubtless at the sacrifice of a little "elegance", economy of time and money and encouragement to trade might be effected. The thing to do is to track down and square "some authority on etiquette".



In the 1939 Awards for British Packaging organised by *Shelf Appeal*, British Alkaloids, Ltd., gained the Silver Award in the shipping containers classification with this corrugated case. Designed as a collapsible unit, the new shipping case can be stacked more economically than the wooden type and takes no longer to assemble in the packing room. The judges' opinion was that the ingenious arrangement of double-walled corrugated buffers provides excellent cushioning and protection. Designed and produced by *Eburite Corrugated Containers, Ltd.*

PACKAGING HISTORY

Milner Gray, R.D.I., N.R.D.

BEFORE the days of mass production and mass distribution, when every town and the agricultural district surrounding it formed a more or less isolated community, self-contained and self-supporting, there was more point in branding cattle than in branding goods.

Glass Replaces Leather and Earthenware

About 1640, glass bottles began to replace the leather and earthenware bottles. Glass was expensive, and the late seventeenth century saw its squat wine bottles, identified by a blob of glass applied to the shoulder, stamped with the sign of the inn or family to which it belonged. These bottles were, of course, hand blown, and, by reason of the iron oxide which the raw material still contained, were yellowish or green in colour.

By 1675 flint glass was in use, and wine bottles became clearer, but kept their squat shape. In 1695 there were 88 glass factories in Britain, 39 of which were making "common bottles".

The eighteenth century saw the introduction from Germany to England of the tinplate industry at Pontypool in 1730, saw Nicholas Appert working quietly in his little house at Massey (Seine et Oise) on the foundations of the modern canning industry, saw M. de Ste. Marie Dupré pioneering the use of foil capsules to replace wax in the sealing of wine bottles, saw grocers selling apricots, "prunelloes", mixed fruits and a "very curious plumb" in "paquets", and saw Crosse and Blackwell selling olive oil and mustard.

Canning Industry Started

The dawn of the nineteenth century witnessed the birth of the canning industry. In 1806, Appert's preparations—the results of his experiments for preserving in bottles a wide range of meats, vegetables, fruits and even milk—were tried out experimentally by the French navy, and apparently proved successful.

In 1810, Augustus de Heine and Peter Durand had taken out English patents for the use of iron and tin containers respectively for preserving foods, although neither of them engaged in canning on a commercial scale. In the following year a process clearly based on that of Appert was developed in England by John Hall, founder of the famous Dartford iron works, and his associate, Bryan Donkin, a Fellow of the Royal Society. A year or so of experimentation, with many failures, passed before the difficulties had been so far overcome that Donkin and Hall's new factory in Blue Anchor Road, Bermondsey, could send tins of preserved foods to high authorities of the Navy and Army for trial. From correspondence during 1813 we know that they were attracting favourable attention.

The Cardboard Container

Concurrently with the early development of canning came the beginning of the cardboard container in this country. Its first wide use was for pill-boxes, and among the pioneers of this packing development was one

Package designs by Milner Gray for a family range of biscuits.

John Bradbury Robinson, a retail chemist, who sold out his chemist's business in 1839, bought a pill-box factory, and founded Robinsons, of Chesterfield, one of the largest box-making firms in the country to-day. In 1846, the Robinsons, John Bradbury and his son, opened a square box department, and in the following year took over a competitor's business at Leicester, transferred his plant to Chesterfield, and began to make chip boxes as well. These were of thin slivers of willow wood, and there was a fairly heavy demand for them from chemists. Chip boxes were used for the sale of powder in the 1850's and later until, when the supplies of willow began to run out, the chip-box business began to decline and faded out.

During the first half of the nineteenth century the rigid box remained, almost exclusively, the package of the chemist's trade. The chocolate and confectionery industry, which was to begin such developments as padded, flanged lids, coloured box tops and fancy shapes, was, up till the 50's, concerned mainly with slab and powder chocolate.

By 1830, Fry's and Cadbury's were selling powdered cocoa in leadfoil-wrapped, paper-banded packages. Earlier, however—in 1824-25—John Cadbury's list of booked sales at his shop in Bull Street, Birmingham, mentions chocolate in canisters, chocolate in squares, and cocoa paste in pots. A few years later, when he was himself grinding and preparing cocoa beans, he offered for sale his own pots of cocoa paste. One of these excellently lettered white glazed pots has been preserved at Bournville.

Labelling of Packages

Up till 1850 the world of commercial printing taken literally was a pretty colourless one. Nevertheless, the seventeenth and eighteenth centuries are particularly rich in fine design and printing, and the tradesmen's cards of this period form a valuable source of reference for traditional design.

Labels of this period were set in type or engraved on steel plates and printed by lithography or letterpress. Coloured illustrations existed only on pottery containers, to which they were applied by means of transfers, and it is not until the 1850's that there appears to be any record of colour label-printing. Baxter, of course, was busy with his limited editions of fine-coloured prints produced from wood blocks.

It was in 1844 that the firm was founded of Elisha, Smith and Alfred Robinson, of Bristol, and played its part in the development of the paper bag. In 1860 the first bag-making machine was invented, and in 1873 Elisha Robinson brought back from America the first patents for the satchel type and bag.

The Industrial Revolution gave the jolt which speeded up the development of packing. It was steam which changed this leisurely progress by centuries into a century and a half of feverish invention, a progression which, partially and momentarily halted by the European War of 1914-18, has advanced even more rapidly in the last two decades; steam, which drove looms and printing presses, which drove the countrymen into the town, the field worker into the factory, the coal-mine, the foundry and the cotton mill, and made a new market for the quickly multiplying horde of manufacturers of food and drink, of soap and patent medicines.

The end of the nineteenth century saw the real beginning of the age of the branded product and the basic principles of container manufacture established.

Machine-Made Bottles

Following the experiments of Arnall and Ashley in 1866, the Ashley mechanical bottle-making machine was patented in 1886, and by 1889 Michael J. Owens had patented his famous rotary bottle-making machine, working on the suction principle and evolved from his first machine, a giant syringe held by the operator, which sucked up molten glass from a cauldron. The fully automatic machine-made bottle had arrived. To-day the Owens rotary can turn out 20,000 large bottles in a day.

The end of the century saw the development which was to bring cardboard into its own use as a packaging material. This was the evolution of the folding box, or carton, the principle of which was brought over from America just over fifty years ago by Isaac Watts Parmenter, a New York milliner.

In the early days of the carton the materials used were strawboard, mechanical wood pulp and white-coated manilla, and, if printed or lithographed, the strawboard or wood pulp was lined with machine-glazed printing or coated paper. This lining was done by hand in sheets. A girl with a tub of paste and a bristle brush covered a sheet of paper with paste, threw it on a board, rubbed down with a dry brush, and the boards were taken away and hung to dry like Monday's washing.

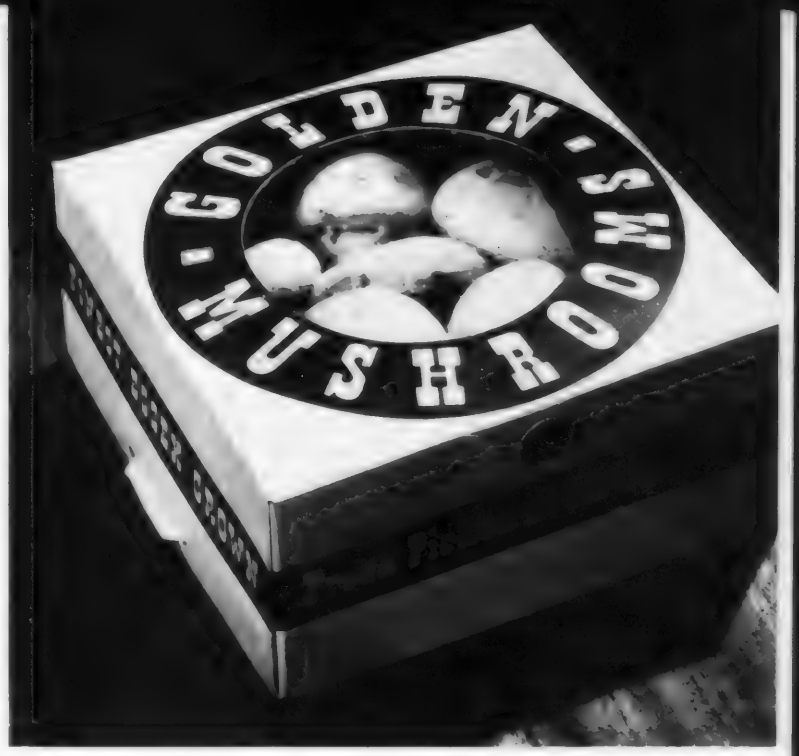
Parmenter's first order in Britain was for 100,000 shell-and-slide cartons for Murray's caramels, with a printed label wrapped round the shell.

Cartons and Metal Containers

The carton had established itself; cartons for eggs and butter, for table jelly—the first table-jelly carton was used by Robertson, of Chelsea—for nuts and bolts and screws and tacks, unobtrusive unprinted cartons for wine and spirits, cartons for sherbet and for cereals.

Metal containers, too, had come into their own. By 1885 there were automatic can-making machines in the U.S.A. with an output of about 1,500 cans a day per unit. With the coming of the vacuum can came devices to make it easy to open. Vacuum tins for tobacco were invented in 1898, and, though subsequently improved, have remained a basic type of tobacco package ever since. Canned salmon was on the market in 1865, the great Argentine meat-canning industry was growing rapidly within ten years from that date, and in 1901 pineapple was canned in Honolulu.

In the first half of the nineteenth century tin had been printed direct from the lithographic stone; later came a transfer method which took the design from the stone in reverse on to a prepared paper and transposed it on to the flat sheets of tinplate. In 1875, Robert Barclay, founder of Barclay and Fry, Ltd., now a branch of the Metal Box Company, invented and applied to tin the offset principle of printing, using glazed cardboard round a cylinder to transfer from stone to tinplate. In 1905, Rubel developed the process for paper printing.



First British pack for fresh vegetables. Black-and-yellow carton, with window and breathing holes, designed by Milner Gray for Golden Mushrooms.

Bottles and Jars

A whole chapter could be written on the development of closures for bottle and jar. Until 1850, bottles were still, as a rule, corked and the cork covered with paper capsules.

The seltzer-water boom of the 70's forced a search for better closures than the cork, and the once familiar marble-in-the-neck stopper came in 1872, invented by Codd.

Towards the end of the century came the crown cork, and about the same time the "Phœnix" cap for vacuum sealing, with an inner rubber sealing band and a locked metal strip encircling it.

At the dawn of the twentieth century the carton was in use, the vacuum can, the collapsible tube, the crown cork, the fully automatic bottle-making machine, lithography was in its glory, and the four-colour process a brilliant and precocious infant.

But a great many things and a great deal of food was still sold loose to the retailer, and all species of packaged products were by no means acceptable to British conservatism. The grocer displayed it on an open shelf at the mercy of dust and flies, handled and fingered it lovingly, and gave it to his customer in a paper bag which often stuck and had to be separated by atmospheric pressure supplied by his lungs.

It was America that changed all this and taught us our first lessons in intensive competitive marketing. America sent over new cereals to compete with porridge oats, dental cream to oust tooth powders from our markets, sent us free samples to whet our appetites, sent us chewing gum and razor blades, tinned soup, canned fruit and motor oil.

It was not that all these products were new to us, but the thoroughness with which they were sold to us, that brought the lesson home. Every quality and aspect of the product was shown to us to be better than those of its competitor. Even the bottle, tin or box in which the product was packed was treated as a selling force. If the customer found your bottle, tin or box easier to open than that of your competitor, this in itself was a selling point, and selling points were beginning to become important as competition grew keener.

And so in this twentieth century we have seen a very spate of packaging innovations, new devices for keeping your product hermetically closed, new devices for making it easy to open, new uses for old containers; milk in bottles and mustard in tubes; new processes for freezing fruit; new materials for containers, thermo-plastics, cast resins and cellulose acetate; patents and inventions too numerous to list.

The 1914-18 war period saw packed or wrapped powdered eggs, powdered milk, margarine and many other food substitutes.

Coincident with this spate of inventions, social and economic changes have affected the story of the package. More especially in the last two decades there has been a re-orientation of class distribution; upper-class and middle-class families have become smaller and the purchasing power of the working class larger. With the growth of the big store the personal touch between the grocer and his customer no longer counts for very much, packed foods are quick to buy, easy to handle and economical to store.

These markets provide the patrons for whom the package designer works, those old and new materials the media in which he designs.

The Designer's Function

Before a package is designed, the designer must find out exactly the purposes which it has to fulfil. He must know what kind of public the product it contains is intended to reach, and what kind of shop will sell it. He must know what is to be its primary appeal, whether utility, luxury, economy, novelty. He must decide on

its size, shape and colour in relation to the consumer's taste and to the dealer's shelf. Having been well grounded in æsthetics, he must forget æsthetics and think in terms of the ultimate buyer.

His first concern is to collect and collate the information on which his design will be constructed. He will ascertain the scope of the manufacturer's organisation and equipment for packing, the possibilities of its extension, the methods peculiar to his particular business. He will investigate the market for which the product is produced, assessing the relative value of the dressing of competitive lines. He will go into questions of practicability and economy of production, of appropriateness of colour, of harmony with the product, of legibility and attention value, of ease of handling of the pack in transit and on the dealer's shelves, questions of stacking and of mass patterning for purposes of display. Every package has to serve the purpose of advertising the product it contains everywhere it goes—in the window, on the counter, in transit, on the dealer's shelf and in the consumer's cupboard. It should be legible and distinctive, an expression of the product it contains. It should be recognisable immediately and, if possible, easily describable.

The designer must know something of the conditions of factory handling, warehousing and transport. He must think in terms of the conveyor which will carry the carton or bottle to be filled and packed. The base of the carton must not be so narrow as to prevent it standing steady on the quickly moving belt. The bottle must not be top-heavy nor have a narrow projecting rim at the base, which may cause it to override its neighbour and jam the conveyor. It may not have neat, sharp corners, which, because the glass is so thin, will chip and break. He must take into account the margin of error due to the humidity of the atmosphere from day to day and the consequent swelling or shrinkage of paper in the trimming of a printed wrapper. These are some of the conditions that the package designer must remember before he sits down to his drawing-board.

He must be prepared, too, to think in terms of many and widely different materials. Printed board, foil, pressed wood, transpaper, glass, earthenware, aluminium, chrome-plated brass, moulding compounds—all have special beauties of their own; all have problems and limitations peculiar to and forms appropriate to themselves. All these materials and others are the media in which the package designer works. He must know by what processes they will be fabricated and remember that he is designing for the machine. Designing for machine production has this difference from designing for handcraft, that it calls, not for manipulation, but for mental facility. The chief characteristic of handcraftsmanship is endless variation; of machine production, precision and exactitude. Handcrafts progress by experiment—by trial and error; machine production by meticulous preplanning.

The whole process of modern industrial production stresses this difference. The great cost of machine tools, necessitating the strictest economy; the vast duplication of units; the many hands through which the simplest product has to pass; the long routine that intervenes between the inception and the finished result—all emphasise the need for the most precisely planned initial concept. The use to which the product is to be put and the process of its manufacture will therefore determine its shape: tasteful and knowledgeable control of these factors will determine its proportion. An appreciation of function must precede the control of form. By function do we mean the control of its mechanical construction that will allow us to open the tin or bottle without spilling the contents or cutting our fingers? No; we have shown that we mean something more than this, that our well-designed container must appeal to the particular prospective purchaser by means of specific qualities. What are these qualities? The complete function of the container includes the capacity to attract, to interest, and to differentiate.

Must attract, and can do so within the ideology of the market at which it is aimed by the nature of its form, colour, pattern, its appeal to the eye, its æsthetic value—its beauty of its kind; must interest, and can do so by typifying and stressing those qualities of the product which will commend themselves to the market at which the product is aimed; must differentiate, and will do so by the character of the design which emerges naturally as a result of the application of the individual outlook of the particular designer to the distinctive background of the manufactory of which the package is a product.

What a wealth of fine traditional design lay hidden in the Victorian housewife's larder! Those lovely pots of preserve put out by Crosse and Blackwell which must have surrounded the youth and childhood of so many of us.

The charm of these containers and their labels lies in their embodiment of a fine tradition of design; but their commercial value to-day lies in their association with another tradition—the good living which they were created to serve.

From a paper read before the Royal Society of Arts by Milner Gray, R.D.I., N.R.D.

Thickening Agent for Soups and Sauces

CASEIN in a form which rapidly disperses in soups and sauces and can therefore be used as a thickening agent for foods is isolated by the process outlined in U.S. Patent 2,142,093. The starting material is a wet curd prepared by heating skim milk to about 110° F. and then quickly and intimately mixing with hydrochloric acid. With the object of bringing the whole of the casein to the isoelectric point, the curd is then bathed in its whey for 10 to 20 minutes, when the acid in the whey penetrates into the curd granules.

The curd is finally washed free from acid and sugar. The wet curd prepared in this manner from 1,000 lb. milk is mixed with 1,000 lb. water for 30 minutes at 145° to 165° F., when a glue-like solution is formed which may be film- or spray-dried unless destined for use in liquid form.

Advantages of the preparation are neutrality, tastelessness and freedom from lactose. The fact that little of the natural colour of foods is lost when boiled with this form of casein is ascribed to the absence of lactose.

PREVENTING FOOD SPOILAGE*

There is hardly any article of food the freshness of which cannot be considerably prolonged by the use of appropriate wrappings and packagings. This is a valuable record of the principal researches conducted on this subject up to date, prepared by

WILLIAM CLAYTON, D.Sc., F.I.C.

MUCH ATTENTION is now being devoted to wrappings for protecting foods from various types of spoilage. Even the more familiar paper wraps and containers demand special measures to avoid uncontrolled development of micro-organisms in the pulp and paper mills. Thus, chlorination of water, removal of slime accumulations, and the control of fungus contamination by introducing copper sulphate at focal points—these and other measures ensure a finished paper free from infective dangers.[1]

The sterilisation of wrapping materials demands 44 hours' holding at 190° F. (88° C.), the stacks of materials undergoing treatment not being larger than 15 cubic feet with ample air space around each stack. All spores are killed by this heating, and the wrappers have been successfully used for wrapped meats.[2]

It should be noted that the effect of exposure to sunlight is important for paper, since *physical* degradation often accompanies chemical changes in the paper.[3]

Butter Wrapping

Butter boxes may lead to mould troubles owing to the timber. It has been observed that Swedish-pine timber impregnated with wax is less susceptible than white pine to mould growth, but it may give "timber taint" to the surface of the butter. Promising results obtained in New Zealand for controlling mould growth were gained by immersing the boxes for 10 minutes in a 0·1 per cent. solution of Shirlan (sodium salicylanilide).[4]

Surface defects in butter can arise from the effect of air, light and loss of water, with a deepening of the yellow colour and the absorption of foreign flavours or odours. Barnicoat found that such defects could be greatly reduced by wrapping in tinfoil or in parchment-coated metal foil. Thus, after storage for 5 months in white pine wooden boxes, butter stored at 32° F. scored 3½ points lower than similar butter stored at 14° F., whereas in tinfoil the butter stored at 32° F. was only 1 point lower than that stored at 14° F. Sweet cream butter, salted or unsalted, lost 2 to 2½ points when stored at 14° F. for 8 months, while when stored at 15° for the same period the loss in score was only 1½ points.[5]

Dried Fruit

Strikingly simple and yet surprisingly effective is the curtailment of insect infestation of dried fruit by using shade cloths of cotton fabric of weave more open than cheese-cloth. Figs, apricots, peaches, pears, seedless raisins and dates have been protected at a cost of only 25 cents per ton. For example, tests on three ranches in 1937 revealed an average infestation of 21,700 moth larvæ per ton of seedless raisins in exposed boxes and only 1,600 per ton in boxes covered with shade cloth.[6]

Citrus Fruit

Farkas, of Jerusalem, has recently dealt with the rot during storage of citrus fruit and has obtained valuable results with wrapping paper impregnated with diphenyl. Rot during storage and transport has been reduced to even a tenth of that normally experienced. Two trial shipments to England of such wrapped fruit showed reduced losses from 54 to 5 per cent. and from 33 to 6 per cent. respectively.[7]

Cheese requires special care in packaging, and since 1934 the valve-vented can has been employed for curing and ageing cheese. The 5-lb. valve-vented can takes a 5-lb. loaf of cheese or 20 4-oz. prints wrapped separately. To avoid darkening where the cheese contacts the can, lacquered tinplate is needed. Parchment, metal foils and transparent celluloses are used for individual wrapping, and the cans are preferably key-opened to permit clean removal of the contents.[8]

Metal Foils

Metal foils, especially tin and aluminium, find extensive application to-day. Not only are they readily adjustable to irregular surfaces, but they are moisture-, insect- and light-proof. They are usually backed with a protective coating of wax, vinyl resin, glassine or paper, and they are obtainable for self-sealing by application of heat.[9]

A special problem in wrapping concerns store-burn, amber-coloured shrivelled patches on the surface of frozen meats, which arise from the evaporation of ice crystals. Tiny air pockets are thereby left behind, and they scatter incident light, so making the tissue appear lighter in colour. These patches persist to some extent even after thawing, proving that the drying of the muscle fibres is an irreversible process. Excessive drying resulting in store-burn can be related to a low relative humidity of the air in the cold store and, in the case of wrapped products, to absorption of water by the wrapping material—*e.g.*, wood or paper.[10]

Moran avoided store-burn in frozen lambs' kidneys even after 6 months' storage at 14° F. (−10° C.) by using a paper prepared by layering aluminium foil with

a parchment paper on one side and a waxed paper on the other. Similarly, store-burn in frozen poultry can be avoided by packing in boxes lined with two layers of aluminium foil grease-proof paper, whereas grease-proof paper alone fails.

Latex Rubber Bags

The Cry-o-Vac wrapping method is the latest idea in this field. The Dewey and Almy Chemical Company of America introduced this new process for wrapping foodstuffs that are to be refrigerated. A very thin latex rubber balloon is drawn tightly around the package, which is then vacuumised. Finishing is effected by immersion in warm water to remove wrinkles and leave a fully protected and smooth package. Complete prevention of loss of moisture is obtained, and thus freezer burns are absent from the frozen food.[11] The idea began with experiments for the French army on the rapid freezing of beef quarters, and the latex rubber bag was suggested by Hoveman.[12]

Wax-coated rubber sheets for packaging cheese prevent formation of rind and of surface mould growth, yet permit escape of CO_2 during curing.[13]

Permeability of Wrappings

Probably the most important aspect of packaging materials relates to the passage of moisture through them. Carson, of the U.S.A. National Bureau of Standards, has examined ten factors which influence the loss or gain of moisture in packaged foods.[14] One must agree with him that "it is frequently found puzzling that a membrane or sheet of material that is practically impermeable to dry air may allow comparatively easy passage of the water vapour in air, which is seldom more than 2 or 3 per cent. of the mixture of gases of which the air is composed. This favouritism toward the passage of moisture vapour or atmospheric moisture shown by some food wrappings and other membranes that seem impermeable to gases is not only puzzling, but may be annoying, embarrassing and expensive".[15]

Whilst it is obvious that water vapour may penetrate membranes via their defects, it is not so obvious why penetration can occur if the membrane is entirely sound. One explanation is that, owing to a difference of moisture content in the air on the opposite side of a membrane-wrapped food, the membrane material absorbs moisture and tends to equalise its distribution by diffusion or flow through the material.

The variables listed by Carson are: (1) *Time*, so that a steady rate of transpiration may be reached; (2) *area*; (3) *leakage*; (4) *thickness*, although overall permeability may be much more important than unit thickness; (5) *vapour-pressure difference*, which as a first approximation determines the rate of passage of moisture; (6) *relative humidity*, a very high value increasing the rate of transpiration more than is expected from the difference of vapour-pressure alone; (7) *temperature*, increasing the driving pressure of transpiration and, occasionally, damaging the membranous material; (8) *total pressure*, which may affect the membrane by bulging; (9) *diffusion in still air*, as circulation is necessary for accurate test purposes in order that uniformity of humidity obtains in testing; (10) *state of moisture*, different materials responding differently to liquid water and water vapour.

A water-proof, grease-proof and air-tight wrapping material has been prepared by B. F. Goodrich Company, of Akron, Ohio. It is termed Koroseal paper, and consists of koroseal (a synthetic elastic resin) applied to 40-lb. kraft paper. It flexes repeatedly without cracking, softens at 200° F. and can be sealed against itself at 390° F.

Studies of Rancidity

During photochemical studies of rancidity, determining the peroxide values of oils as affected by selective light, Coe and Le Clerk[16] observed that corn oil and cottonseed oil would remain free from rancidity if protected from light with opaque black paper or with green paper transmitting light delimited by wave-lengths 4900 to 5800 Å. Morgan[17] points out that blue and invisible ultra-violet light materially accelerate the development of rancidity in such materials as potato chips, crackers, cakes, butter, candies, nuts and soaps, whereas other visible light such as red and yellow has little effect. Consequently, rancidity-retarding wrapping may be of any visible colour except blue. On this basis has been developed a yellow, transparent, cellulosic sheeting known as Sylphrap r.r. old gold. The usual thickness of 0·001 inch has a high visible transparency but a complete ultra-violet opacity.

Protection Against Light

Enough is now known to infer that both ultra-violet and visible light greatly accelerate the oxidation of fats, the former being the more effective. The most active portion of the visible spectrum is the yellow-orange region at about 6000 to 6500 Å. and the green between 5000 to 5500 Å.; the least active is the far red region.[18] Carpenter[19] recommends green glass for bottles to protect fruit juices such as apple and kraut juices. In his research, flavour and turbidity of the juices were altered by light acting on the colloidal constituents present.

Lately, work published from the Heinz laboratory[20] deals with the effectiveness of coloured samples of cellophane in retarding the oxidation of olive oil. The factors influencing protection are listed as: the quantity of light transmitted, especially ultra-violet light; the stability of the dye pigment in the sample of cellophane to the action of light. The samples showing the greatest protection were deep red, orange, violet, grass-green and yellow.

The patent literature reveals some interesting ideas for protection against light. Foils of cellulosic character, or of gelatin, are impregnated with esculin or a coumarin derivative.[21] The transparent coating may be combined with an organic dye that renders it opaque to light of 2900 to 4700 Å. and non-absorbent of light of wave-lengths other than this range.[22] The light-filtering wrapping of a cellulosic nature[23] may contain an amino-benzophenone for absorbing light rays of 3500 to 3700 Å.

(*Continued on page* 390)

HOW DOES WAR INFLUENCE FOOD PACKAGING?

The practical requirements of any packing material do not alter according to peace and war. It is their relative importance that changes. Some of the problems confronting food packers in their search for substitute materials are discussed by

R. L. ROWNEY, F.R.Econ.S.

THE INCIDENCE of war on food packing, as on packing generally, makes itself felt, in the first place, in two directions. It means a shortage of certain raw materials and it increases costs all round. This implies a general tendency to examine the possibility of using substitutes where the employment of the normally used material is precluded either by reason of absolute shortage or by reason of a prohibitive rise in its cost. War also leads to an examination of the question how far the productive process may be adjusted so as to accord with changed conditions, but here there are certain ineluctable conditions—which we shall examine in some detail later—which set limits to the degree of processing adjustment which is possible. A further factor to be considered in this connection is that, quite apart from the difficulties which it introduces into existing packing systems and technique, war also presents certain new requirements, which may or may not be easily attained with the available productive apparatus.

Metals Severely Affected

So far as raw material shortage and costs are concerned, war affects differently the various types of packing. Most severe, of course, are the broad effects of shortage felt in the metallic section. The general system of rationing of tinplates and other metals has been associated with price increases, while certain metals—such as aluminium, whose main packing utility is for caps—are becoming virtually unprocurable commercially. Glass is much less severely hindered, though production costs are higher, but wooden packings are both scarcer and dearer, while fibre packings of various types are not yet on the "danger list".

Incidentally, in the transparent wrapping sphere an interesting position has arisen. The trend towards the viscose process and away from such forms as cellulose-acetate, which has been so marked in recent years, appears now to be in danger of reversal. The viscose process depends largely on wood pulp, the price of which has been rising and which looks like rising much more, whereas the acetate process is relatively more fortunately placed in regard to raw material costs.

The Search for Substitutes

It will readily appear that the trend towards substitutes does not mean that manufacturers of each type of packing look for something quite new. In the first place, the manifestation of such a trend towards substitute materials might be that, say, metal packers examine the possibility of switching over to certain other established packing materials, such as glass or wood or fibres. It is after this shift round that the search for quite new materials or new forms develops.

And here it is necessary to consider the limits set to the use of substitutes. Quite separate from the overriding problem of suitability, there is the purely processing problem. It is always costly to inaugurate substitute materials. The period of research, for instance, is expensive. But over and above such matters there are the three basic considerations, which may be tabled as the "ideal", the "operative" and the "marketing", though, in fact, their spheres overlap considerably.

In the first category come such problems as hygiene, which must be maintained at the highest possible level. In the second come the various processing requirements. It is not, for instance, a practicable proposition to introduce a substitute where the processing requirements of the new material are so widely different from those already used that new plant is required, or where the process itself is seriously slower or more expensive. The third category contains the buying habits of the public, with which is associated the whole idea of goodwill. Change here may mean loss.

When Substitutes are Necessary

In a word, it is necessary to understand the reasons behind the search for substitutes before the practicability of the problem can be considered. If the usual packing material became completely unobtainable there would be no alternative but to find something else. That condition would be rare indeed, however. And when the problem is one of cost, the choice must depend upon very careful assessment, not only of the apparent items, but also of such evasive matters as the goodwill with the buying public which has been built up with a certain recognisable type of packing.

Nor is the general problem to be viewed in the light of ordinary peacetime experience. War brings a profound difference to the period of potential warehousing, making the protective factor in packing of increased importance. It also tends largely, by the operation of pools and rationing of foods, to eliminate the competitive stimulus,

so that the element of attractiveness in packing is relegated to a much lower position than in peacetime. This may be contrasted with the previous comments on goodwill, but it is to be remembered that the maintenance of goodwill, which is more the recognition by the public of a special type of packing, carries over into the post-war period.

Convenience *v.* Utility

It also tends to annul the difference between packing designed for convenience and that designed for preservation, for it increases the time lag between production and consumption—*e.g.*, those celebrated tins of butter.

What specific effects, then, is the war having and likely to have?

So far there have been few, if any, really fundamental changes. Foods still appear in much the same sort of packing as they did before the war. Given the continuance of the war, however, we may expect to see some profound changes. They will be chiefly determined by the availability and cost of materials, but other, unpredictable influences must not be overlooked. There is, for instance, the question of destructibility. In war, despite such decentralisation as the authorities can engineer, foodstuffs are concentrated in warehouses, none of which can assure complete immunity from aerial attack. If the bombers do come in earnest, and persist in coming, we are going to see indestructibility elevated into one of the main principles of packing.

Requisites of War Packing

Elsewhere I have pointed out that the big four practical requirements of any packing material do not alter according to war and peace. It is their relative importance which changes. These requirements are portability, durability, availability and dependability, and to them we may add one other—economy. If one had to isolate a specific type of packing which came most near in wartime to satisfying all requirements, the choice would probably rest on glass. What is the obvious advantage of this material? That in wartime it possesses the virtue of availability in special degree. It also has advantages over, say, metal or wood in constancy of price, and it does the job of preservation superlatively well. What are its disadvantages? It is more susceptible to destruction by aerial attack than most other forms of packing because it may be wrecked by the indirect effects of explosion.

Use of Metals

What of metal? It cannot be said to possess any marked degree of availability or of economy in wartime. It has durability, but it should be noted that its continued use after the initial disruption of the tin in opening depends upon its being melted down, whereas glass packings need only to be sterilised before they are again ready for use. Metal packings have, however, a large advantage in portability, and for purposes requiring this asset they are largely irreplaceable.

Special considerations affect wood, fibre and paper packings. Wood does not score heavily on availability or on relative economy, but in any case its primary utility so far as food packing is concerned is for crates and large container boxes, and even here it is replaceable by certain fibrous materials and paper and board products. The difficulties already being encountered by the fibre packers have previously been noted. They do not so much concern us here, however, because of the limitation, similar in many directions to that imposed on wood, of the use of this material for food packing.

Paper is a different problem. It is too early to say to what extent paper, which is the "convenient" packing *par excellence*, loses part of its market by the trend away from convenience and towards preservation caused by war. In general, the wood pulp difficulties may mean an increasing tendency to substitute acetate forms where possible. The process may also be seen here which appeared in Germany when it became necessary to conserve metallic resources. Tinfoil, used so largely in packing cheese, may give place to paper or to some such sort of fibrous product as *ersatz* Germany claims to be superior for the job of protection and preservation.

Production Methods Govern Substitutes

It is not, however, a matter for the directors of packing companies to discover the ideally best substitute and to adopt it. The overwhelming compulsion of the capabilities of existing processing methods and productive plant rules that out, and the adjustment to the war situation arises, in the first place, by the search for substitutes within the same sphere as those already employed. In metals, for instance, there can be no question of the employment of some radically novel material in the first place. It is a question of examining different metallic forms. And so with the other packings.

Moreover, the nature of the foodstuff to be packed presents an insurmountable obstacle to the free adjustment of material. The broad division of foods into wet and dry reveals the difficulty. The appropriateness of certain materials for dry food may mean that they are completely inappropriate for wet foods—such as fruits in juice, sauces, soups, etc. It has been shown that paper or fibre products may contain liquids and wet foods, but the limitation of their use is apparent when we consider the standard of portability and storability set by war conditions. Nevertheless, some movement towards the substitution of these products for metallic and glass packings is to be expected.

Adjustment of Costs

In so far as the major consideration is price, it should not be overlooked that there is considerable scope for adjusting costs of packing by reducing the quantity of packing. Certainly there is no substantial proportion of modern food packing which can be called purely decorative, but, taking the field as a whole, there are certain items which it may be found possible to dispense with. How far adjustment along these lines will serve to postpone the more fundamental adjustments which a long war must inevitably bring it is impossible to say.

THERMOPHILIC ORGANISMS IN STARCH AND SUGAR

An exhaustive review of the work of investigators on the important group of thermophilic organisms to be found in starch and sugar, and a description of methods for their culture and examination.

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THE IMPORTANCE of canned food spoilage cannot be over-emphasised. It is important from two viewpoints. First, an enormous financial loss must be borne by the packer in case of spoilage. Secondly, a health hazard exists for the consumer when spoilage is due to toxigenic organisms. The organisms studied in this problem are, as far as we know, important only from the first viewpoint; they are not pathogenic to man, but do cause undesirable changes in foods.

Investigation of Spoilage

Knowledge of causes of spoilage and their correction is the best insurance against losses. Attention has been called to three sources of spoilage organisms:

1. Those originating directly from the soil and introduced into the can along with the food product.
2. Those resulting from accumulation by growth in certain parts of the machinery within a food processing factory.
3. Those added along with some ingredients.

The importance of sugar and starch concerns those in the last two groups. For all practical purposes, raw foods contain few spoilage organisms.

Sugar has been studied bacteriologically for many years. The early studies were not concerned especially with food spoilages, but with organisms which were deteriorating finished sugar by inversion or fermentation. All of this work will not be reviewed since it is beyond the scope of this study. Much of this literature has been reviewed by Tanner (1932).

The historical evidence which first incriminated sugar as a source of contamination of food products is interesting. At the end of the 1925 package season, a spoilage of canned peas was reported to laboratories of the National Canners Association. The outbreak was serious on account of the financial loss involved and, since the causative agent was unknown, future packs were threatened. By all outward appearances, the plant had been operated as in previous years, so that understerilisation might probably be eliminated as an explanation. This outbreak was thoroughly examined by Cameron, Williams and Thompson (1928), laboratories of the National Canners Association. Examination of the spoiled pack showed most cans were "swells", though some "flat-sour" spoilage was encountered.

Laboratory Work Begun

At the beginning of the 1926 packing season (peas and corn) the National Canners Association established a laboratory in the factory involved, in order to study factory conditions first hand. Stress was placed on thermophilic anaerobes and flat-sour spoilage organisms. Because these latter organisms were easily detected and enumerated, more weight was given to this group when evaluating results. The same methods were involved in the elimination of both types. Early in the investigation it became apparent that high counts were obtained just before closing the cans after a factory shut-down period. This, then, was evidence that products were being contaminated from growth in machinery in the factory, and the source was yet to be determined. The peas were comparatively free of thermophiles prior to passage through the blanchers, thus localising the source to some extent. Further study showed an important source to be brine. Contamination was always greatest in the mornings, and as the tanks were used during the day the brine had fewer micro-organisms. But in every case counts were high following shut-down periods. Since wooden tanks were used, it seemed probable that wood was harbouring the organisms. By lining the tanks with tin and not holding brine overnight, thermophilic counts were markedly reduced. The same procedure was followed during the corn packing season with confirmatory results.

Study of brine constituents—water, salt and sugar—followed. Water and salt analyses all gave negative results; sugar was just as regularly positive.

Non-Acid Products

Cameron and Esty (1926) analysing results secured from bacteriological examination of 5,594 cans of spoiled and unspoiled non-acid products, were able to classify flat-sour spoilage bacteria as mesophiles, facultative thermophiles and obligate thermophiles. Facultative thermophiles were organisms which grew at both 37° C. (98° F.) and 55° C. (131° F.). "The evidence of this laboratory tends to eliminate the mesophilic spore-forming organisms as causative agents in typical flat-sour spoilages." Thus only thermophilic organisms, whether facultative or obligate, are considered important.

Esty and Stevenson (1925) outlined methods for examination of spoiled canned foods, classifying spoilages,

according to condition of the cans and contents, as flat cans, flippers, springers and swells. A description is given of possible causes of each.

Three Groups of Thermophiles

In National Canners Association Bulletin No. 25-L, Cameron, Williams and Thompson (1928) have given a more complete explanation of causes of spoilage. "Many kinds of thermophilic bacteria do not cause spoilage in canned foods. There are three groups, however, that are of outstanding importance. All three form spores of high resistance to heat. These are:

1. The "flat-sour" thermophiles, so designated because spoilage by them is characterised by the production of acid but no gas, and the food becomes sour but the can does not swell. . . .
2. The "thermophilic anaerobic" bacteria. These organisms grow only in the absence of air. Growth is followed by gas and acid production, and the food sours and the container swells as a result. . . .
3. The "sulphide" spoilage bacteria. These also grow only in the absence of air. Hydrogen sulphide gas is formed, but owing to its solution in the can contents, the can remains flat. Also, the hydrogen sulphide combines with iron to form black iron sulphide. . . .

When it was suggested that sugar might contain thermophilic spoilage organisms, thorough bacteriological examinations were made by the National Canners Association for the three groups of thermophiles known to be important in food spoilages. Cameron and Williams (1928) reported that spores of flat-sour thermophiles were found in essentially all cane sugar samples examined. The number was as high as 100 spores per gram in some samples. Thermophilic anaerobes not producing hydrogen sulphide were periodically found, while spores causing sulphide spoilage were rarely found. Beet sugars were practically free from thermophilic bacteria causing flat-sour spoilage, the counts varying from 0 to 4 per sample. However, the thermophilic anaerobic spores were more prevalent than in cane sugars. Beet sugars were free of sulphide spoilage organisms.

Further Work on Sugars

James (1928) confirmed the work of Cameron and Williams. Examination of 197 samples of commercial sugars showed the presence of aerobic saprophytes, thermophilic anaerobes, sulphide spoilage and flat-sour types. Spores of flat-sour producing bacteria were abundant. From two samples *Escherichia coli* was isolated, though not considered significant. James said, "The findings are important from the food canner's and confectioner's viewpoint inasmuch as the organisms cause certain well-defined types of spoilage".

Papers by Cameron and Williams (1928) and James (1928) precipitated considerable controversy on the part of some sugar refiners. Ingersoll (1930) was reluctant to believe that sugar was as contaminated as reported. He charged that Cameron and Williams drew false conclusions from their work in investigating the 1926 operation of the canning factory. Ingersoll took the position that since canning factories in the past had operated with no spoilages traced to sugar it should not be incriminated. His opinions were refuted by Bigelow (1930), who stated that four refiners, appreciating the fact that sugar was contaminated, were taking immediate steps in co-operation with the National Canners Association for studying methods of relieving the situation. O. B. Williams (1930), in a letter answering Ingersoll's, stated his conviction that thermophiles in sugar were important. Cameron (1930) vigorously denied drawing false conclusions from the results presented and quoted a portion of the National Canners Association Bulletin No. 25-L (p. 11), which definitely stated its position on the sugar question:

> "It is probable that sugar is rarely so highly contaminated as to lead to direct spoilage. It seems certain, however, that thermophilic spoilage infection may be carried by sugar and thus inoculate various units of the canning machinery, and at these points the contamination may develop to an extent where it will become a factor of spoilage."

Ingersoll later accepted this opinion.

Sugar Samples Give High Flat-Sour Spore Counts

Cameron and Yesair (1931) pointed out that canned foods were not always contaminated by plant equipment alone; sugar could be directly responsible for spoilage organisms. Some sugar samples were found which had flat-sour spore counts as high as 2,000. (Maximum according to standards, 75.) "But the significant thing is that if a canner who used this sugar had sterile equipment, he would still have been marketing a non-sterile product. If there were times at the height of the pack when cooling was inadequate, it would be expected that there would be spoilage in the pack. If the products were shipped to the tropics, it is not unlikely spoilage would occur." Some of the thermophiles were so heat-resistant that it was not practicable to destroy them by processing. Adequate cooling was the only means of controlling their growth. Since most of the organisms were believed to be obligate thermophiles they would not grow at storage temperatures, and rapid cooling of the cans was found to be imperative. Cameron and Yesair offer Table A as proof that sugar may directly contaminate canned foods:

TABLE A.

SPOILAGE OF NO. 2 CANS CORN DUE TO THERMOPHILES IN SUGAR.

Process Time at 250° F.	*Per Cent. Cans Spoiling.*		
	No Sugar.	*Sugar A.*	*Sugar B.*
70 min.	0	0	95·8
80 min.	0	0	75·0
90 min.	0	0	54·2

Sugar A.—Sugar suitable for canning non-acid foods according to National Canners Association Standards. Flat-sour count 60 spores per 10 grams.

Sugar B.—Not suitable for canning according to National Canners Association Standards. Flat-sour count 2,500 spores per 10 grams sugar.

In the Netherlands, Homans (1933) found all three groups of spoilage organisms in various European sugars. He claimed Dutch sugars to contain more sulphide spoilage bacteria than have been reported in America.

Owen and Mobley (1937) were of the opinion that sugar investigations should not be limited to the three groups of spoilage organisms. It is entirely probable that the non-acid aerobic thermophiles are significant in food spoilages, and that the mesophilic organisms often constitute a highly undesirable infection in uncooked human foods and unsterilised beverages. Whether non-acid producing aerobic organisms are significant is doubtful. They are naturally undesirable, but probably cause no spoilage in hermetically sealed cans. In most cases where high counts of flat-sour spoilage organisms were found, there was a corresponding low count of non-flat-sour organisms. They offered the explanation that acid-producing thermophiles suppress others.

Thermophilic Spoilage Organisms

Although bacteria were shown by early workers to be responsible for food spoilages, considerable time passed before the organisms causing them were thoroughly studied. Donk (1920) reported results of work on a heat-resistant thermophile isolated from flat-sour spoilage "Standard Maine Style Corn" which had been packed in the usual manner and processed at 118° C. (245° F.) for 75 minutes. The same organism was also isolated from spoiled cans of string beans and corn on the cob. Donk proposed the name *Bacillus stearothermophilus*, which has been generally accepted by food bacteriologists.

The cause of sulphide spoilage of canned corn was determined by Werkman and Weaver (1927). An organism recognised as the cause was isolated and named *Clostridium nigrificans*. Canned food "swells" were studied by McClung (1935), who isolated a new organism to which the name *Clostridium thermosaccharolyticum* was given.

Table B is a summary of the morphological and physiological characteristics reported by the original investigators.

Thermophilic Contamination in the Sugar Factory

Considerable work was necessary on the part of refiners for removing thermophiles from canning sugars. The source of infection had to be located and methods instituted which would destroy opportunities for growth. Cameron and Bigelow (1931) first reported results of investigations on the presence of thermophilic bacteria in sugar mills. Owen and Mobley (1932, 1933) also contributed to the same subject. The conclusions from these three reports were summarised by Calton (1936):

1. Filtration plays one of the most important rôles in the removal of thermophiles and thermophilic spores.
2. Accumulation may occur before and after filtration.
3. Crystallisation, although less effective than filtration, excludes a large degree of contamination from the sugars.
4. Contamination is confined to the crystals surface and is greatest in clumps of crystals.
5. Contamination of syrups bears no relation to purity.
6. Flat-sour thermophiles can grow in concentrations as high as 40 per cent. raw sugar syrup; growth and acid production are rapid in concentrations up to 25 per cent.

Calton also reported results of an extensive investigation for spoilage organisms within a beet-sugar house.

TABLE B.

	Flat-sour Spoilage.	*Sulphur Stinker Spoilage.*	*Thermophilic Anaerobic Spoilage (Swells).*
Organism	Bacillus stearothermophilus (Donk)	Clostridium nigrificans (Werkman and Weaver)	Clostridium thermosaccharolyticum (McClung)
Morphology	Rods, majority singular, few pairs, few chains. 3·5 × 0·8μ	Rods, 3·6 × 0·5μ	Long, slender, granulated rod, sometimes in pairs, no chains. 3·5-7·5 × 0·4-0·7μ
Spores	Polar 1 × 1·5μ	Subterminal, no swelling at sporulation	Terminal, swelling at sporulation
Gram reaction	Negative	Positive	Negative
Motility	Negative	Positive in young cultures only	Positive
Oxygen relationships ...	Aerobic : facultative anaerobic	Obligate anaerobe	Obligate anaerobe
Optimum temperature ...	50° C. (122° F.)	55° C. (131° F.)	55-60° C. (131-140° F.)
Minimum temperature ...	45° C. (113° F.)	30° C. (86° F.)	30° C. (85° F.)
Maximum temperature ...	76° C. (169° F.)	65-70° C. (149-158° F.)	62° C. (143° F.)
Fermentation	Acid, no gas	No reaction on 28 sugars, alcohols, glucosides	Acid and gas from monosaccharides, disaccharides, polysaccharides, glucosides. No growth in alcohols
Thermal death time ...	100° C. *p*H 6·1 17 hrs. 120° C. *p*H 6·0 11 min.	100° C. *p*H 7·0 450 min. 118° C. *p*H 7·3 50 min. *p*H 6·8 40 min. 121° C. *p*H 7·0 35 min. *p*H 7·8 25 min.	Not determined

(*To be continued*)

BOOK REVIEW

Textbook on Canning

Canned Foods. *Issued by the Canned Foods Advisory Bureau. 7 sections. 2d. each.*

Destined primarily as a textbook for use by domestic science teachers and students, this newest publication issued by the Canned Foods Advisory Bureau is divided into seven sections, which cover the history of the tin can; its making; its contents; details of canning methods; food values of canned foods; their domestic uses; and, finally, a series of questions and answers.

The preparation of the different sections has been entrusted to authorities on their subjects, who have picked out the main points of their matter and distilled them into the plainest language. The sections written by Dr. Clayton on the processing and food values of canned foods are examples of judicious selection and compression, and the inclusion of the reports of different investigators on the effect of canning upon the vitamin content of foodstuffs is a good idea. Possibly it may have already been done, but if not, it would be an excellent move to send this section to every general medical practitioner in the country, as judging from the persistent cropping up of detractive statements about canned foods by isolated medical men, these matters have not yet been realised by at any rate the rank and file of the profession, and it would be interesting to know whether they form a part of the present curriculum.

In Section 6 Miss Janet Bond gives some useful hints on the buying, storage and use of canned goods, and a particularly useful page of can sizes with their capacities—number of "servings"—is included. This might have been made more complete and might with advantage have been classified under the names of the different foodstuffs.

Finally, the questions and answers in the last section are well selected and, one would imagine, would cover almost everything that the intelligent housewife could possibly ask about canned foods. The replies are excellently and convincingly expounded.

Each section is priced at 2d., but we are informed that if any authoritative person connected with the industry writes on his firm's letter-heading to The Canned Foods Advisory Bureau, 243, Regent Street, London, W. 1, they will be issued with a complimentary copy.

The booklets are artistically produced and illustrated and placed in a stout binder, and should form a valuable addition to canned food propaganda. Those who planned it may be congratulated on the very judicious way in which they have visualised the needs of the particular public for which it has been prepared.

Chemical and Bacterial Changes in Sea-Fish During Storage

By Dr. S. A. Beatty

The greater part of the sea-fish—cod, haddock, halibut, flounder, and others—taken from waters off our Eastern Atlantic coast, and marketed at home, is distributed without any preservative treatment other than storage as near the freezing point as is economically feasible. The following is a brief summary of the investigations into the chemistry and bacteriology of such fish during storage carried on at the Atlantic Fisheries Experimental Station, Halifax, Canada.

It has been shown by numerous investigators that the organisms producing spoilage in our Northern Atlantic fish are derived in the main from the slime and the fæces of the fish themselves. As these fish seek temperatures just above the freezing point, the organisms are acclimatised to these temperatures. They have been shown to proliferate readily in the region of 1° C. During gutting these organisms are smeared over the whole of the body cavity and the soft nature of the tissues makes for easy penetration and rapid spoilage.

The investigations under discussion were aimed to differentiate the effects of bacterial spoilage from those of autolytic degradation, to provide some fixed criterion for estimation of the state of preservation, to study the physiology of the spoilage organisms, and to determine the actual changes in the tissues as a result of the action of these organisms.

It was found that, apart from some minor effects, autolysis is negligible in comparison to bacterial spoilage.

The period of rapid increase in volatile bases was found to agree with the period of rapid bacterial proliferation. Fractionation of these bases showed them to consist of ammonia, trimethylamine, and a trace of dimethylamine. Dimethylamine increases first, then trimethylamine, and finally ammonia. The period of rapid bacterial increase coincides with the latter portion of the dimethylamine curve and the earlier part of the trimethylamine curve. The trimethylamine values give a good indication of the state of preservation of the fish. Trimethylamine was found to be derived from trimethylamine oxide.

Investigation into the physiology of the organisms concerned showed that the greater part of the spoilage in sea-fish is anaerobic, facultative anaerobes reducing trimethylamine oxide to trimethylamine and utilising the oxygen for the oxidation of the substrate.

The organisms were found to oxidise carbohydrates and carbohydrate derivatives only, mainly lactic acid and sugar, during the early stages of spoilage, the production of volatile bases rendering the fish unfit for food before amino acid or protein spoilage gets under way. Sea-fish spoilage, therefore, proceeds in two phases, first a carbohydrate oxidation, and second protein and amino acid breakdown. While the second phase has received most attention of investigators, the first is actually the more important, as it is during this period that the fish actually spoils. *(Paper presented at the Second Technology Conference at the Massachusetts Institute of Technology.)*

PREVENTING FOOD SPOILAGE

(*Continued from page* 384)

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* *Abstracted from a paper which was to be read at the Bournemouth Conference (cancelled) of The Sanitary Inspectors Association.*

FOOD COLOUR REGULATIONS IN U.S.A.

A. G. KEMP

FROM JANUARY 1 next no foodstuffs containing coal-tar colours other than those certified by the U.S.A. authorities will be permitted to be sold in the United States of America, and manufacturers of foodstuffs in Britain who wish to export their products to the U.S.A. must conform to certain regulations.

These regulations are very important, and they may best be explained by outlining the scope of the Food and Drugs Act under which they come.

On June 25, 1938, the Senate and House of Representatives of the United States of America passed an Act, now known as the Federal Food, Drug and Cosmetic Act. This Act, which is much more comprehensive in scope than previous Acts of a like character, covers a field far beyond the sphere of foodstuff manufacturers, but it is not intended in this article to venture into this wider field. We will confine ourselves to those parts of the Act and subsequent regulations referring to colours in foodstuffs.

Earlier Regulations

It will be recalled that under earlier laws of the U.S.A., a list of coal-tar colours permitted for use in foodstuffs was tabulated. These were:

Ponceau 3R.	Colour Index No.					80
Amaranth.	,,	,,	,,			184
Erythrosine.	,,	,,	,,			773
Orange I.	,,	,,	,,			150
Naphthol Yellow S. ..	,,	,,	,,			10
Tartrazine.	,,	,,	,,			640
Yellow AB.	,,	,,	,,			22
Yellow OB.	,,	,,	,,			61
Guinea Green B.	,,	,,	,,			666
Light Green SF. Yellowish.	,,	,,	,,			670
Indigotine.	,,	,,	,,			1180

to which were subsequently added: Brilliant Blue FCF., Ponceau SX., Sunset Yellow FCF., Fast Green FCF.

Many users must have wondered, as the writer did, why these particular colours were chosen. There is nothing particularly to recommend them for colouring foodstuffs. Many other coal-tar colours can be produced in just as pure a form as those chosen, and the range selected is so very limited that it is impossible to produce certain shades from the colours listed.

In England, no seaside resort is complete without its "Rock", and the one colour used above all others for this purpose is Rhodamine. There is no colour to replace it with any degree of success, but Rhodamine finds no place on the U.S.A. list, and there are many similar examples. Further, no account is taken of the purposes to which the foodstuff colours are put. What would our producers of breakfast sausage do to obtain a scarlet colour to shade the skins of their produce? Where could a black colour be obtained for the many trades which need it? It is evident that this list was not produced with any desire to assist the maker of foodstuffs to use colours at all. Rather was the use of colours very strongly deprecated, and the selection of a list of colours which could be used was merely an admission that their use could not be entirely eliminated.

The list is such that only those coal-tar colours which can very easily be distinguished by the authorities are listed. Every colour selected can be distinguished by a simple test, and cannot be confused with other colours. Consequently, any foodstuff examined shows immediately whether or not it is coloured with a permitted colour. This, then, was the governing principle of the formulation of this list. Only from the analysts' point of view is there much to commend it. At the same time, as foreigners, we can offer no opposition to the law of a land, and those who would export to the United States must necessarily conform to its laws.

Why Fresh Legislation?

Why, then, was there the necessity for fresh legislation concerning foodstuff colours? As has already been explained, a list of colours was laid down under the Act, but although legislation was produced which provided for the certification in the U.S.A. of coal-tar colours to be used in foodstuffs, there was no control over the colours used in *foodstuffs imported* into the U.S.A., other than that they must be chemically identical with those named on the approved list. Whilst chemically identical, therefore, they might be contaminated with impurities which could not be detected in the finished foodstuff. It was this that the fresh legislation aimed at overcoming, and it has certainly succeeded in doing so. Henceforth, only coal-tar colours which have been actually certified by the U.S.A. authorities can be used, for the new Act lays down that a food shall be deemed adulterated if it bears or contains a coal-tar colour other than one from a batch that has been certified in accordance with the regulations, as provided by Section 406 (with certain reservations regarding the colour of citrus fruit).

Here, then, is the crux of the new Act as far as manufacturers of foodstuffs containing coal-tar colours are concerned. Any coloured foodstuffs which they export to the U.S.A. must be coloured only with coal-tar colours which have been certified by the U.S.A. authorities.

In the new Act itself no list of colours which may be used is given, but Section 406 (b) states:

"The Secretary shall promulgate regulations providing for the listing of coal-tar colours which are harmless and suitable for use in food and for the certification of batches of such colours, with or without harmless diluents." So much for the Act itself, which has now definitely closed all the loopholes which previously existed as far as the colouring of foodstuffs for the U.S.A. is concerned.

Only one point remains. The Act states that it shall take effect twelve months from the date of its enactment —*i.e.*, on June 25, 1939.

Enforcement of Act

On December 22, 1938, certain regulations for the enforcement of the Act were promulgated by the Secretary of Agriculture. Amongst these regulations is one applying to Section 303 (c) of the Act which lays down that "No person shall be subject to the penalties of subsection (a) of this section" "for having violated Section 301 (a) where the violation exists because the article is adulterated by reason of containing a coal-tar colour not from a batch certified in accordance with regulations promulgated by the Secretary under this Act, if such person establishes a guarantee or an undertaking signed by, and containing the name and address of, the manufacturer of the coal-tar colour, to the effect that such colour was from a batch certified in accordance with the applicable regulations promulgated by the Secretary under this Act".

These regulations state that a guarantee or undertaking referred to in Section 303 (c) (3) of the Act shall state that the shipment or other delivery of coal-tar colour covered thereby was manufactured by a signer thereof. It may be a part of, or attached to, the invoice or bill of sale covering such colour. If such shipment or delivery is from a foreign manufacturer, such guarantee or undertaking shall be signed by such manufacturer who resides in the U.S.A.

It will be seen that this regulation does not apply to foodstuff manufacturers in countries outside the U.S.A., but to those in the U.S.A. who use colours manufactured outside that country, and therefore does not really concern the reader in Great Britain.

Listing of Harmless Colours

On January 5, 1939, a notice was given by the Secretary of Agriculture of a Public Hearing for the purpose of receiving evidence upon the basis of which regulations may be promulgated providing for the listing of coal-tar colours which are harmless and suitable for use in foods, etc., for the certification of batches of such colours; for procedures thereunder; and for the payment of fees therefore.

The proposed regulations were given for the listing of colours, for certification thereof and for the payment of fees for such service. The colours enumerated were those which on May 9 were given new names, as set out in the next column. Mixtures of these were also proposed for certification with provisos. The fees for the service proposed were $15 for each request—*i.e.*, for each batch of colour submitted irrespective of the weight of the batch. The fee for admission of additional coal-tar colours to listing was an advance deposit of $500, and thereafter advance deposits of the same amount (unless the administration authorises deposit in other amount) whenever necessary to prevent arrears in the payment of such fee.

The Public Hearing was held and the detailed findings were published dated May 5, 1939, and this stated that in future instead of the utilisation of numbers assigned to certain colours by the colour index of 1924, published by the Society of Dyers and Colourists in England, a uniform system of nomenclature in assigning technical names should be used in and throughout the regulations promulgated and that the system adopted by the American Chemical Society should be followed in assigning a technical description, or name, to each of the coal-tar colours listed in such regulations, and also to any coal-tar colour that may be subsequently added to those listed in such regulations. Specifications were given for certain colours, proposals for sampling, storage and packaging, certification, labelling, records of distribution, procedure for admitting colours to listing and fees for the service were confirmed.

New Nomenclature

On May 9 a list was issued by the U.S. Department of Agriculture, giving the new names of colours listed for use in foodstuffs, which are as follows:

New Name	Former Name
F.D. & C. Blue No. 1.	Brilliant Blue FCF.
F.D. & C. Blue No. 2.	Indigotine.
F.D. & C. Green No. 1.	Guinea Green B.
F.D. & C. Green No. 2.	Light Green SF. Yellowish.
F.D. & C. Green No. 3.	Fast Green FCF.
F.D. & C. Orange No. 1.	Orange I.
F.D. & C. Orange No. 2.	Orange SS.
F.D. & C. Red No. 1.	Ponceau 3R.
F.D. & C. Red No. 2.	Amaranth.
F.D. & C. Red No. 3.	Erythrosine.
F.D. & C. Red No. 4.	Ponceau SX.
F.D. & C. Yellow No. 1.	Naphthol Yellow S. (Sodium Salt.)
F.D. & C. Yellow No. 2.	Naphthol Yellow S. (Potassium Salt.)
F.D. & C. Yellow No. 3.	Yellow AB.
F.D. & C. Yellow No. 4.	Yellow OB.
F.D. & C. Yellow No. 5.	Tartrazine.
F.D. & C. Yellow No. 6.	Sunset Yellow FCF.

A Public Hearing was announced for July 5, 1939, for the purpose of receiving evidence upon the basis of which regulations may be promulgated amending "Regulations under the Federal Food, Drug and Cosmetic Act for the listing of coal-tar colours" by changing certain specifications of certain listed colours and the listing of certain other coal-tar colours. The proposed amendments were announced which followed the lines of the list set forth above, and later it was announced that a further colour had been admitted to the list—*i.e.*, F.D. & C. Red No. 32, formerly Oil Red XO.

Meantime, the Senate and House of Representatives had decided that the date of coming into force of that part of the Act referring to the use of coal-tar colours in foodstuffs should be postponed until January 1, 1940.

It will be necessary for manufacturers exporting coloured foodstuffs to the U.S.A. to state on their invoices the name or names of the colours used, and the batch number of the certified colour or colours employed. The batch numbers must be given on the containers of the certified colours employed when delivered by the coal-tar colour manufacturer.

NEWS FROM THE INDUSTRY

PACKING

Reinforced Waterproof Packing Material

A material which is now being used extensively for the packing of such commodities as desiccated coconut, dough improvers, powders and other damageable products, is an ingeniously reinforced waterproof packing paper known as "Fibreen" which, besides being absolutely impervious to moisture, grease, dust or dirt, is, in addition, almost untearable. For such purposes as the above it is made up into single and multi-wall bags and keg liners.

Some typical examples of its application, apart from its uses as ordinary sheets for wrapping and the making up into waterproof bags and sacks, are for the lining of crates, cases and drums, also for baling. In many instances it is claimed that it can, with equal efficiency, take the place of expensive drums and kegs. An important advantage of this paper is that it can be used, in most cases, many times over, and thus a considerable saving in packing costs is effected. The paper is said to be ideal for packing products which require to be kept in a moist or plastic condition, as, besides keeping moisture out, it will also, if desired, keep moisture in.

The suppliers are J. H. Sankey and Son, Ltd.

The material is available in a range of standard rolls each 100 yds. in length and in varying widths of from 3 ft. to 7 ft., each containing from 900 sq. ft. to 2,100 sq. ft.

* * *

New Can Top

The search for an easily opened can is one that has been continuous ever since the canning industry started. The can top, the patents for which are owned by Easycantops, Ltd., has resulted in the production of a top furnished with a unique association of annular rings and a scoring or semi-cut. To remove this can top it is only necessary to puncture it at any point on the score with an instrument such as a long nail, screwdriver or, in fact, any sharp-pointed tool and lever sharply over the edge of the tin. The operation of levering automatically folds the annular rings so as to form a point of reinforcement, thus preventing any tearing or buckling of the lid during removal. This process of opening is simplicity itself, and leaves a clean edge.

Realising that a large measure of the success depends upon the accuracy of the score, the company have produced an automatic scoring machine which will definitely score the plate to a predetermined depth, despite variations in gauge or hardness, an accuracy which ensures that the strength of all tops after scoring is constant and that all tins will open satisfactorily.

The cost of production of cans fitted with the patent top is practically the same as the ordinary commercial cans in use to-day, the operations involved in their production being the same, with the addition of the application of the score.

* * *

Impregnated Containers

In order to keep their production to as straight a line as possible, Pearlite Box Co., Ltd., are standardising special sizes. They are also trying to increase supplies so as to help as much as possible special cases where firms are finding it difficult to get their usual ones, and to keep prices down as low as possible in spite of existing difficulties.

They have been most fortunate so far with regard to supplies of raw material from overseas as they have not lost a single shipment.

* * *

Electric Soldering Irons

The new range of "All-Day" electric soldering irons has been designed by A. H. Wilkes and Co. to give long life and trouble-free service. The design is extremely simple, being built up on the unit principle. All parts are instantly removable, interchangeable and replaceable. The handle acts as a screw lock for the whole tool.

A special feature of the heating element is that it is totally enclosed and adequately protected from corrosion by flux and flux fumes. The element is not disturbed by removal of the special copper alloy bit, where shape, size and composition reduce oxidation to the minimum.

A moulded terminal block makes it impossible to transmit any strain from the cable to the heating element. The tools are fitted with 9 ft. length three core cab tyre cable, having an earthing wire to comply with Home Office Regulations.

Filling Machine

A filler of the very latest type having eight filling pockets is the Kellie Continuous Rotary Filling Machine, Type F.P., for soups, sauces and all liquid or semi-liquid products, with no-can-no-fill arrangement. No plungers nor pistons are used, only gravity, and consequently no damage is possible to the solid matter. This machine fills, without drip or waste, all liquid or semi-liquid products that flow reasonably freely.

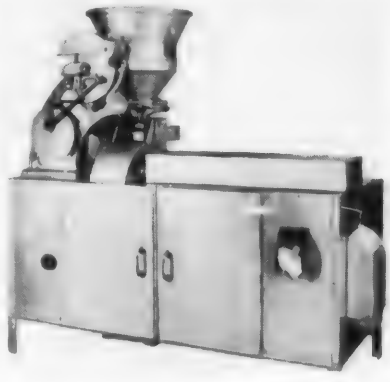
The standard machine Type F.P. is usually sent out equipped to fill A.1 cans with interchangeable parts for A.1 tall cans. Spare parts can be supplied which will permit all sizes of cans up to A.3 being filled by the machine, and a special machine is constructed to deal with A.10 or gallon size cans.

* * *

Weighing and Filling Machines

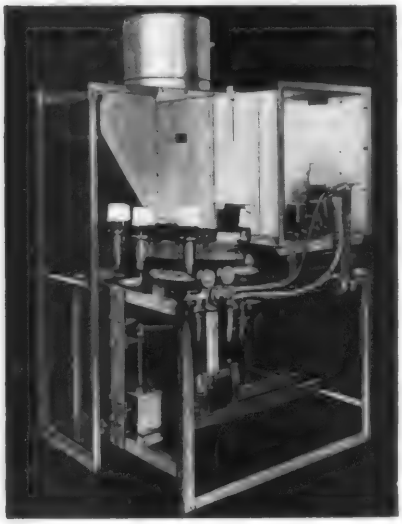
Owing to the abnormal demand for sugar and cereals in small packs, the Automatic Weighing and Packing Machine Co. have found considerable interest in their single Beam type of Weighing Machine, and a number of firms have installed these to get over the initial rush.

Labour shortage combined with a brisk demand is also creating interest in other packing plants, and a machine has been recently perfected for automatically feeding, filling, and sealing small bags and envelopes for custard powder and similar commodities. These have a range of speeds from 43 to 130 per minute. The illustration below shows one of these machines.



PLANT AND EQUIPMENT

Rotary Spray Coating Machine



The Rotary Spray Coating Machine made by The Aerograph Co., Ltd., is built in a wide range of sizes for high-speed application of protective finishes to cartons and other food containers. The machine here illustrated shows how it consists of a rotary table fitted with spindles to hold the cartons. These spindles revolve automatically as they pass the fixed spray, thus ensuring that the cartons receive an even and thorough coating.

* * *

Gravity Conveyors

The gravity conveyor manufactured by Herbert Morris, Ltd., will take shoes, books, bolts, beer barrels, chemicals, furniture, potatoes, groceries, starch, provisions, cigarettes, stout, pies, cookers, refrigerators, and, in fact, practically anything that needs transport from one part of the factory to another by a method which involves no loss of time or labour.

As described in a booklet issued by the firm, gravity conveyors can be built up to suit each factory's individual requirements. For instance, it is advisable to have two narrow conveyors for wide loads, and it is a point worth noting that narrow spacing of the rollers is best for short loads, and wide spacing for long loads. Standard sections are 10 ft. in length and very easily joined together. A 45° or 90° curve can be supplied, but other curves can be supplied as required. The addition of a plain or roller spiral provides a chute for the goods to pass to a despatch or unloading department.

Sometimes in the course of a long run some extra elevation is necessary, either at the start or at some intermediate point. The Morris lifter has been designed for this purpose.

Towards the end of the booklet is a section describing a great number of other useful devices such as switches and turntables, overhead conveyors, a dial for selective delivery, sack pilers, etc., all of which are designed to bring the "walking about" time down to a minimum.

* * *

Small Capacity Homogeniser

In order to meet the demand for a small capacity homogeniser, Improved Emulsification Process Co., Ltd., are marketing the "Impulsor", providing an output of eight or ten gallons per hour, depending on the viscosity of the material being processed. This machine possesses all the advantages of the true high pressure type of homogeniser. Although small in size and capable of handling experimental batches of emulsion in the laboratory, this machine has been more particularly designed to meet the requirements of the commercial user who needs a machine of sufficiently robust construction to run for long periods without skilled attention.

* * *

Non-Drip Apron

There are a number of wet jobs in the food industries where an ordinary apron—even if waterproof—affords inadequate protection. The Dunlop Rubber Co. have overcome this difficulty by putting on the market recently a special non-drip apron. It is made according to their patent method of proofing which gives the maximum amount of resistance to friction and extra strength down the centre. They have devised a novel method of fastening at the waist which is easily adjusted, and the channel at the foot of the apron, which drains away any water running down the face of the apron, keeps the feet and legs dry. Despite its strenuous wearing properties, this apron is extremely light and comfortable to work in.

* * *

Hearths

Containing illustrations and particulars of hearths of all types, furnace and blowpipe, "Alcosa" smiths' hearths, etc., catalogues have been issued by William Allday and Co., Ltd., of Birmingham.

Smiths' hearths are manufactured in various patterns, single, double, Scotch and so on. The single hearths are constructed throughout of cast iron, with the exception of the back plate which is made of heavy gauge plate. Each has a cast iron canopy hood, deep recessed cast iron bottom, and movable gap pieces in the sides allowing long bars to be heated. One point of note is the increased water space in the tue irons, resulting in much longer life.

The double hearth suitable for two fires is fitted with two improved type cast iron water boshes and tue irons. A full smoke hood is fitted which is constructed of extra heavy gauge mild steel plate, with cast iron flue outlet.

* * *

Electric Lighting

Lighting equipment which, when correctly applied, will provide the finest visual conditions, is described in a catalogue issued by Benjamin Electric, Ltd. It is divided into three parts, dealing with industrial lighting with tungsten lamps, with discharge lamps, and commercial lighting. Particulars of each kind of fitting are set out in a clear and concise manner with illustrations, and the subject-index has been arranged in alphabetical order.

One section is devoted to the Saaflux system of reflector construction which, when it was introduced some years ago, was claimed to be the greatest advance in the design of lighting equipment since the science of lighting came into being.

* * *

Laboratory Mill

The most notable plant introduced in recent months by Buhler Brothers for the food industry is their large laboratory mill, Type M.K.S.

Although originally introduced as a laboratory machine, it is capable of grinding about 400 lb. of wheat per hour, which approximates to the production of one 280-lb. sack of flour per hour. Although flour in England is generally packed in bags of 140 lb., the capacity of a flour mill is reckoned in sacks of 280 lb.

This machine was introduced because of the notable success achieved for the smaller laboratory mill, Type M.C.K. Both these machines are built on the same lines as a commercial flour mill, and the M.K.S. is, in fact, a flour mill in miniature, capable of producing commercial flour at a reasonable cost.

The amount of manual labour necessary to operate the mill is confined to the minimum.

The finished products obtained are patent flour, baking flour, bran, and pollards.

ALUMINIUM

New Aluminium Shop Front

Many new ideas in British shop-front design have resulted from a competition for a new shop front and entrance constructed in aluminium, organised by the Northern Aluminium Company, Ltd., in conjunction with the Building Centre.

In the design of the winning entry advantage was taken of the suggestion that the entrance might be placed at the left hand of the site. Thus the space in front of the existing stairs was utilised as a vestibule, leaving the whole frontage for display. The authors felt that the natural colour of the aluminium with small areas of coloured anodising would give the most dignified and best result both as a shop front and a display of aluminium.

* * *

Advertising Black-Out

The wisdom of continuing advertising during the war was stressed by Mr. Harold Eley, Dunlop advertising manager, in a talk, "No Advertising Black-Out, Please", given recently to the Advertising Club of Birmingham.

They could now, he said, review the situation more reasonably than was possible in the first days of September when in many quarters there was a panic tendency to "drop everything".

After all, the spending power of large sections of the population, despite taxation, was greater to-day than it was two months ago. Evacuation and the movement of troops had shifted large masses of the population from one part of the country to another, but all of them still needed clothes, boots and shoes, food, fuel, soap, household appliances and so on.

It was true that to-day different firms had different problems. Some were on war work, others sold luxury products, others products which the war had brought into greater prominence; yet none of these groups could safely regard advertising as a luxury. On the contrary, it was a fundamental source of strength to each of them, not only in selling their goods but in maintaining the goodwill established in peace time.

No manufacturer could afford to allow the public to forget his name.

SYNTHETIC VITAMINS

Vitamins

A survey of present-day knowledge of vitamins is presented in a booklet issued by Roche Products, Ltd., entitled "Vitamins in Medical Practice", which deals with the properties, functions and uses of all the vitamins of recognised value in medicine. The information is presented in the form of a concise and accessible summary giving only essential details, and consequently very convenient for quick reference.

Roche Products, Ltd., are manufacturers of synthetic vitamins B_1 and C, which are issued under the trade names of "Benerva" and "Redoxon" respectively. They have also recently commenced production on a technical scale of synthetic vitamin E—viz., α-tocopherol in the form of its acetyl ester, which is perfectly stable.

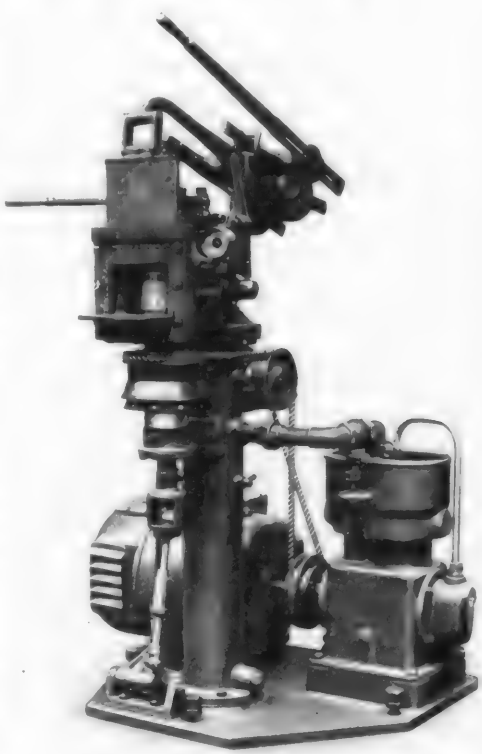
The form of packing Roche products is shown in the illustration.

* * *

"Modern Engineering"

This publication is intended to give a general idea of the diversified range of products manufactured by Tangyes, Ltd., of Birmingham, and to indicate the modern equipment now available for many industries and industrial processes. The book is divided into sections, hydraulics, power presses, pumps, etc., all extensively illustrated and accompanied by particulars of each plant and the number of the catalogue where further details and information may be obtained.

The map at the end of the book gives an idea of the extensive world representation held by Tangyes.



* * *

Vacuum Seaming

The method of closing cans, bottles, and containers of all kinds of types under vacuum has come to the front in recent years owing to the advantages it offers. There can be no doubt as to its value for all meat products, fish, dried fruits, sweets, coffee, and other material where it is desirable to retain the flavour and aroma or to keep the material dry for considerable periods. The illustration shows a semi-automatic hand and power operated machine which takes any size can from $2\frac{3}{8}$ to 6 in. diameter and from $2\frac{3}{8}$ to 10 in. deep. The change over from one size to another can be made in a few minutes, which is useful to the canner who has short runs on one particular line and then wishes to change to another. It is being used by several well-known packers of meat paste, pâtés, and tongues. It is self-contained with its own vacuum pump and motor and takes very little power to run it. Made by Ashworth and Parker, Ltd.

A.R.P.

Conversion Adaptors for A.R.P. Lighting

In industrial and commercial premises such as factories, shops and offices where it is desired to alter existing fittings to comply with A.R.P. requirements by reducing the lighting intensity, a conversion adaptor is almost a necessity. For instance, it may be found that the original fittings were designed for high wattage lamps with long necks and E.S., G.E.S., or even B.C. caps; they are then unsuitable for use with low wattage lamps unless some form of extension incorporating a shade ring to take an A.R.P. shield is provided.

A range of conversion adaptors, converting from G.E.S., E.S., and B.C. respectively to B.C. and providing extensions of 4, 3½, and 3 inches, has been designed by the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C. 2. Each of these adaptors has a body of brown porcelain, which is fluted to facilitate turning and fitted at the top end with the appropriate lamp cap and at the bottom with a G.E.C. Economic type B.C. lampholder and Ideal shade ring (Figs. 1, 2 and 3).

For use in fittings where no variation of lamp-cap position is necessary, the G.E.C. has introduced another type of adaptor consisting of a brass shell with a G.E.S. external thread and an E.S. internal thread. This enables existing lamps of 300- to 1,500-W. rating with G.E.S. caps to be replaced quickly by 15- to 150-W. lamps with E.S. caps (Fig. 4).

* * *

A.R.P. Larder

With the present necessity of keeping a supply of, but not hoarding, essential foodstuffs, the British Medical Association have issued a very helpful little booklet entitled, *How to Stock Your A.R.P. Larder.*

It suggests a week's supply of food for a family of five, giving the amounts of the various foods and the approximate cost. Accompanying this are hints on storage and a few sample recipes for one dinner. There are further practical notes on the use and preservation of food, and a table giving the analysis and food values of civilian tinned rations.

The last page of the booklet is devoted to a table of the mineral, vitamin, protein, and fat requirements of adults and children. The price of this booklet is 2d.

GOVERNMENT PURCHASE

Cocoa

The Colonial Office announces that His Majesty's Government have undertaken, as a war measure, to purchase the whole 1939-40 crop of British West African cocoa. The prices paid to producers will be fixed for the whole season on a basis of 9s. per load for Gold Coast good fermented, and £16 10s. for Nigerian f.a.q. cocoa, ex scale port of shipment. The crop will be handled by the European, African, and other shippers already established in the trade, who will act as agents for the Government and will be paid on agreed remuneration for their services. Each shipper will be allotted a share of total purchases based, broadly speaking, in the case of the larger shippers, on purchases over the last three seasons, and in the case of the smaller shippers, many of whom have only recently entered the trade, on last season's purchases.

A moratorium on cocoa sales and purchases has been declared in Gold Coast and Nigeria in order that the necessary arrangements for introducing the scheme may be made by the Colonial Governments. These arrangements will include the setting up of local control organisations which will obtain returns of existing stocks and contracts and make such other local arrangements as may be required. It is hoped that Government purchases can begin at an early date.

His Majesty's Government have also undertaken to offer to purchase, at prices to be determined in relation to the prices paid for West African cocoa, maximum quantities of cocoa produced in Trinidad, the Windward Islands, and Ceylon; these quantities to be based on normal shipments to the United Kingdom in past seasons.

Sales will be effected in the United Kingdom and other markets so far as possible through normal trade channels. An Advisory Committee, representative of the firms with organisations in the United Kingdom engaged in shipping cocoa from Colonial Dependencies, is being constituted.

* * *

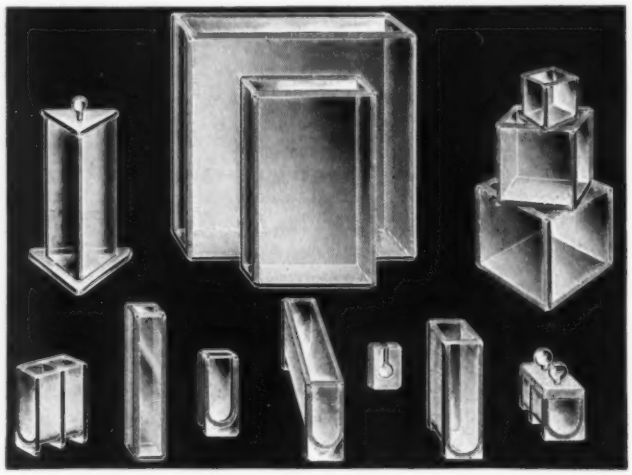
Technical Advertising

The business of Maurice G. Parker, Ltd., who for nearly twenty years have specialised as Consultants in Technical Advertising, will be transferred from 16, Bennett's Hill, to larger offices at 3, New Street, Birmingham. Telephone and telegraphic addresses remain the same as before—viz., MIDland 2014 and "Technikad, Birmingham".

* * *

NEW BRITISH INDUSTRY

Fused All-Glass Cells



The war of 1914-1918 drew attention to the unprepared state of the scientific instrument industry in this country: ever since, however, Britain has been rapidly consolidating her position in this field, until there are now few items in this category for which we are dependent on imports. It may be of interest to record that yet another item has now been transferred from the heading "Import" to that of "Export".

Until comparatively recently, Germany has held a virtual monopoly of the manufacture of fused all-glass cells for optical work. The Tintometer, Ltd., of Salisbury, now announce that they have perfected the manufacture of such apparatus, and are in a position to offer all-glass acid, alkali and solvent-proof sintered cells of all types.

These cells are of a high order of accuracy, and possess a delicacy of workmanship which welcomes comparison with the best that Germany can produce. Hollow cubes, hollow prisms, rectangular cells, double light-filter cells and blood cells are all manufactured with equal facility; and the firm has been able to place Britain's name at the top of the world's markets in yet another classification of scientific apparatus.

INFORMATION AND ADVICE

Blood Serum for Sausages—Process for Testing Immature Fruit—Potato Flour & Egg Albumen—Margarine Manufacture—Information Supplied—Information Required.

Blood Serum for Sausages

5,782. *Will you please put me in touch with manufacturers of blood serum for incorporating into sausage meat?* (Salford.)

We suggest you might be interested in an article which appeared on page 319 of our September, 1939, issue, "Separation and Use of Blood Plasma for Sausages", a copy of which can be obtained at 1s.

This fresh blood can best be obtained from a local abattoir, where it can be collected straight from the animal, as described in the above-mentioned article.

Process for Testing Immature Fruit

5,750. *We have heard that some American firms, by means of a floating process, are able to tell mature from immature fruit, and we should be very grateful if you could give us the name of a liquid which has this property.* (Norway.)

We have not heard of this process, but should suggest that you make experiments with using salt as a basis for the solution. You can then experiment with the actual fruit, and by that means establish a standard. Other substances which might be used if the concentrated solution of salt is not dense enough are sugar or calcium chloride. It is hardly needful to say that the solution must be washed off the fruit which has been tested if it is to be used for preserving.

Potato Flour and Egg Albumen

5,592. *We should like information and reference on the evaluation of potato flour and egg albumen.*

With regard to potato flour, we would refer you to the standard books of food analysis. The main thing to look for would be adulteration, which would be detected by standard methods.

The main item with regard to egg albumen is solubility in cold water, which is, of course, ascertained by current analytical methods.

Margarine Manufacture

5,761. *Will you kindly advise us of the methods of manufacture of margarine, the materials required, and, if possible, supply us with names of people who can supply any necessary plant?*

If it is desired to manufacture a high-class margarine, it is absolutely necessary to use the best raw materials.

Fats used are animal fats, beef oleo and lard, without the addition of vegetable oils or fats other than the necessary quantities of the liquid oils, ground nut or cotton-seed oils, to give the required consistency. Hardened or hydrogenated oils may also be used, though they must be applied with discretion. The cheaper makes of margarine are blends of the kernel fats and the liquid oils.

Milk.—Separated milk, which is the other main raw material, is best obtained by separating at the margarine factory whole milk obtained direct from the farmers. Under certain conditions of emergency milk powders may be used instead of natural milk.

The production of margarine consists in blending the various oils and fats until a mixture of the desired firmness is obtained. The molten fats are agitated until homogeneous, then skimmed, soured milk is added, and agitation continued. The mass then is chilled and finally cut in slabs. The market product must be a perfect emulsion of miik serum with fats, and contain no air bubbles. Flavour must on no account be unctuous or tallowy, but a close resemblance to butter—the colour the same as dairy produce and odour almost nil.

The name of suppliers of a complete range of margarine plant was given.

Information Supplied

5,759. *Could you tell us where we would be likely to obtain about* 100 *gallons blackcurrant fruit juice, either sterilised or preserved with benzoate of soda?* (Manchester.)

The name and address of a supplier were given.

5,678. *As we are interested in the manufacture of tomato purée, we should be glad if you would put us in touch with a large manufacturer in England who could give us details of plant required and its approximate cost.* (Transvaal.)

The names of plant manufacturers were given.

Information Required

5,680. *I am seeking a practical working book on chocolate dragées—that is, centres covered by chocolate and polished in revolving pans. A book on general confectionery would be quite in order, but it* must *contain a practical formula on chocolate dragées.* (Glasgow.)

5,752. *Artificial cream may be obtained by viscolising a mixture of unsalted margarine and milk. Can you please supply us with a formula for the production of this cream, using oils and milk, etc., and give the necessary temperatures, or must the oils first be made into a margarine substance?* (Glasgow.)

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RECENT PATENTS

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. *weekly (annual subscription £2* 10s.*).*

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 2s. each.

Substitute for peppermint oil

A composition having similar flavour and smell to peppermint oil consists of synthetic menthol, menthone, menthyl acetate, and menthyl isovalerianate. In an example, 50 per cent. of menthol, 35 of menthone, 12 of menthyl acetate, and 3 of menthyl isovalerianate are mixed together to form an oil of refreshing and cooling taste. There may be added 3 to 5 per cent. of the initial and final distillate fractions obtained from commercial peppermint oil, eucalyptus oil, mint oil, and other similar oils which improve the flavour. These fractions contain terpenes, sesquiterpenes, terpene alcohols, ketones, polysulphides—for example, *d*-limonene, menthene, carvo-menthene, cineol, piperitone, carvacrol, carvo-menthol, thymol, aromatic disulphides, and dimethyl sulphide. The ingredients of the composition may be made by (1) partially hydrogenating thymol to form a mixture of menthol and menthone, which is then treated with a restricted amount of glacial acetic acid, converting part of the menthol into menthyl acetate. The mixture is then distilled to obtain fractions rich in menthone and menthyl acetate. (2) Hydrogenating piperitone in the presence of nickel to form menthone and some isomenthone, which is allowed to remain in the composition. A part of this mixture is removed, and the remainder further hydrogenated and heated at 180° C. to form menthol, as described in Specification 238,314 (Class 1 [i]). Part of the menthol is heated with acetic anhydride and isovalerianic acid to form the ester. The products obtained are then mixed, together with the initial distillate from Japanese peppermint oil.

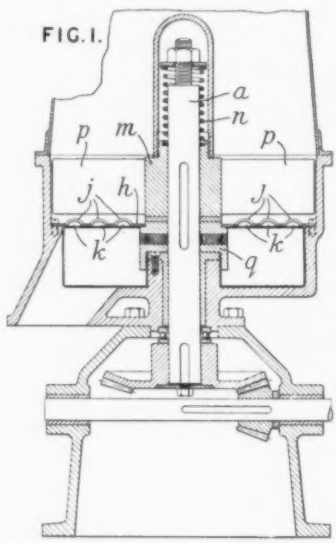
507,257. Harberd, E. H. (Hittel Ges., Dr.).

Recovering volatile liquids

In the culture of yeast and other micro-organisms in which aeration is employed the fermentation gases are washed to recover escaping products such as alcohol or acetic acid by means of unfermented mash or wort in counterflow to the gases, the enriched mash or wort being later used in yeast or micro-organism culture or for fermentation processes. The whole or part only of the mash or wort to be fermented, which may be of sugar, sulphite, waste liquor or wood-sugar, may be used as washing liquid.

505,940. Seidel, M.

FIG. 1.



Disc and like mills

A grating or shredding machine has a stationary disc *h*, formed with projections *j*, beneath which are apertures *k* and a central driven shaft *a*, upon which rotate a vane wheel *m* having inclined vanes *p* and a second vane wheel *q*. The inclination of the vanes *p* is such as to force soft material—*e.g.*, chemicals—through the shredding apertures *k*, the lower vane wheel *q* acting as a scraper. The upper vane wheel *m* may be axially slidable on the shaft *a* against the pressure of the spring *n*.

505,056. Buffoline Noiseless Gear Co., Ltd., and Greenhalgh, G.

Latest Patent Applications

17835. Rokowsky, L., and Kirzner, E.: Anti-diabetic bread, etc. June 19.
16855. Giusti and Son, Ltd., T., Giusti, T., and Giusti, R. B.: Machines for coating ice-cream bricks with chocolate, etc. June 9.
16853. Giusti and Son, Ltd., T., Giusti, T., and Giusti, R. B.: Machines for applying closure discs to containers for ice-cream, etc. June 9.
16569. Gentele, J. G. W.: Production of dried foods. June 6.
16479. Atlantic Coast Fisheries Co.: Fish-treating machines.
16133. Jeffrey, R.: Apparatus for roasting grain. June 1.
21320. Bengers Food, Ltd., Thornley, B. D., and Hilton, S.: Manufacture of rennet. July 22.
21594. Peebles, D. D., and Manning, P. D.: Manufacture of whey powder. July 26.
20992. Crown Cork and Seal Co., Inc.: Mixing apparatus for beverages. (Cognate with 20990.) July 19.
20991. Crown Cork and Seal Co., Inc.: Mixing apparatus for beverages. (Cognate with 20990.) July 19.
20990. Crown Cork and Seal Co., Inc.: Mixing apparatus for beverages. July 19.
20923. Euw, K. E. de.: Condensed-milk container. July 19.
23767. Barr, M.: Treatment of coffee. August 17.
24230. Gurwitsch, L.: Solidified edible fats, etc. August 23.
23983. Hobbs, E. W., and Clark's Optimus Coffee Extract, Ltd.: Device for delivering measured quantities of liquids. August 19.
24038. Lyons and Co., Ltd., J. (Mowbray and Gridley): Manufacture of tea.
23453. Francois, A. E.: Methods of disintegrating cereals, etc. August 14.
23265. International Yeast Co., Ltd. (Standard Brands, Inc.): Manufacture of micro-organisms of the yeast type. August 11.
23652. Lavett, C. O.: Apparatus for drying whey. August 16.
23037. Fischbach, C., Sidler, L. J., and Enquin, J.: Apparatus for the disinfection of vegetable products, etc. August 9.
26689. Ferree, J. C.: Production of foodstuffs. September 26.
26425. Wyk, S. G. van, Heyman, E., Justesan, A. C., and Jorgensen, P. E. B.: Process for preparing a tea product. September 22.
25977. Kempinski, H.: Beverage. September 16.

Complete Specifications Accepted

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at the uniform price of 1s. *each.*

512,564. Rivenburgh, F. L.: Testing and sorting of eggs.
512,673. Danish Bacon Co., Ltd., Hansen, H. E., and Kidney, A. J.: Opening of cans of preserved foods.
511,701. Short Milling Co., J. R.: Organic oxidation products of fatty matter, and process of preparing the same. (Addition to 423,971.)
511,871. Knoblauch, Sons and Co., Ltd., H., and Knoblauch, L. W.: Apparatus for aerating liquids or semi-liquids, more particularly for producing whipped cream.
511,895. Lyons and Co., Ltd., J. (Hughes, E. B., Mowbray, E. G. B. de, and Gridley, E. H.): Manufacture of tea.
511,722. Bustamante, R.: Citrus-cereal breakfast food and methods for the manufacture thereof.
511,753. Meier, R.: Machine for the production of rolls or rings of butter.